Technical Publications

Direction 40472
Revision 15

enCORE™ 14.0 CONFORMANCE STATEMENT for DICOM

iDXA Advance
iDXA Pro
iDXA Forma
iDXA
Prodigy Advance
Prodigy Primo
Prodigy Pro
Prodigy Forma
DPX Duo
DPX Bravo
DPX-NT
DPX-MD+

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REVISION HISTORY

REV	DATE	REASON FOR CHANGE
1	June 23, 2001	Updated for enCORE 4.0
2	July 3, 2001	Updated for enCORE 5.0 Expand MWL queries to include wildcard PN queries. Added specific date queries – today, tomorrow.
3	January 29, 2002	Updated for enCORE 6.0 Removed non standard attribute length restrictions on patient name, patient ID, referring physician, operator's name. Store/Print modality configurable.
4	December 2, 2002	Updated for enCORE 7.0 Added MPPS and Storage Commitment sections.
5	October 15, 2003	Updated for enCORE 8.0 Added Enhanced SR section.
6	November 22, 2004	Updated for enCORE 9.0 Clarified UID generation. Updated laterality, patient orientation and pixel aspect ratio. Changed manufacturer to GE Healthcare.
7	October 23, 2005	Updated for enCORE 10.0 Support Worklist query return values for patient address and phone numbers. Support query by Requested Procedure ID. Set Performing Physician in DICOM file.
8	March 7, 2006	Updated for enCORE 10.2 Study ID generated internally if not received from Worklist SCP. Performed Protocol Code Sequence saved to DICOM file. Added BMC and Area results to DICOM SR.
9	Dec 1, 2006	Updated for enCORE 11.1 Study Description set to same value as Performed Procedure Step Description if present or Protocol Name. Added Radiation Dose module to MPPS and Images. Changed to UCUM standard for all SR units of measurement.
10	April 11, 2007	Updated for enCORE 11.3 Added Query/Retrieve section.
11	September 24, 2007	Updated for enCORE 12.0 Added Encapsulated PDF IOD section.
12	January 28, 2008	Updated for enCORE 12.1 Study and Series descriptions updated in SC and CR IODs. Additional Encapsulated Document Series Module attributes supported.
13	July 29, 2008	Updated for enCORE 13.0 Added MWL option to query by time Added support for storing to multiple image storage devices simultaneously. Study Description source configurable. Use of extended charcter sets configurable.
14	January 28, 2009	Updated for enCORE 13.1 Added support for additional character sets.
15	October 21, 2011	Updated for enCORE 14.0

Entrance Dose in mGy now reports total dose for all images within an exam.

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1. INTRODUCTION

1.1 OVERVIEW

This DICOM Conformance Statement is divided into Sections as described below:

Section 1 (Introduction) describes the overall structure, intent, and references for this Conformance Statement

Section 2 (Network Conformance Statement) specifies the GEMS equipment compliance to the DICOM requirements for the implementation of Networking features.

Section 3 (Secondary Capture Information Object Implementation) specifies the GEMS equipment compliance to DICOM requirements for the implementation of a Secondary Capture Information Object.

Section 4 (Encapsulated PDF Information Object Implementation) specifies the GEMS equipment compliance to DICOM requirements for the implementation of an Encapsulated PDF Information Object.

Section 5 (Computed Radiography Information Object Implementation) specifies the GEMS equipment compliance to DICOM requirements for the implementation of a Computed Radiography Information Object.

Section 6 (Basic Print Meta SOP Class Information Object Implementation) specifies the GEMS equipment compliance to DICOM requirements for the implementation of Basic Print Meta SOP Classes.

Section 7 (Modality Worklist Information Model) specifies the GEMS equipment compliance to DICOM requirements for the implementation of the Modality Worklist service.

Section 8 (Modality Performed Procedure Step SOP Class Definition) specifies the GEMS equipment compliance to DICOM requirements for the implementation of Modality Performed Procedure Step Service.

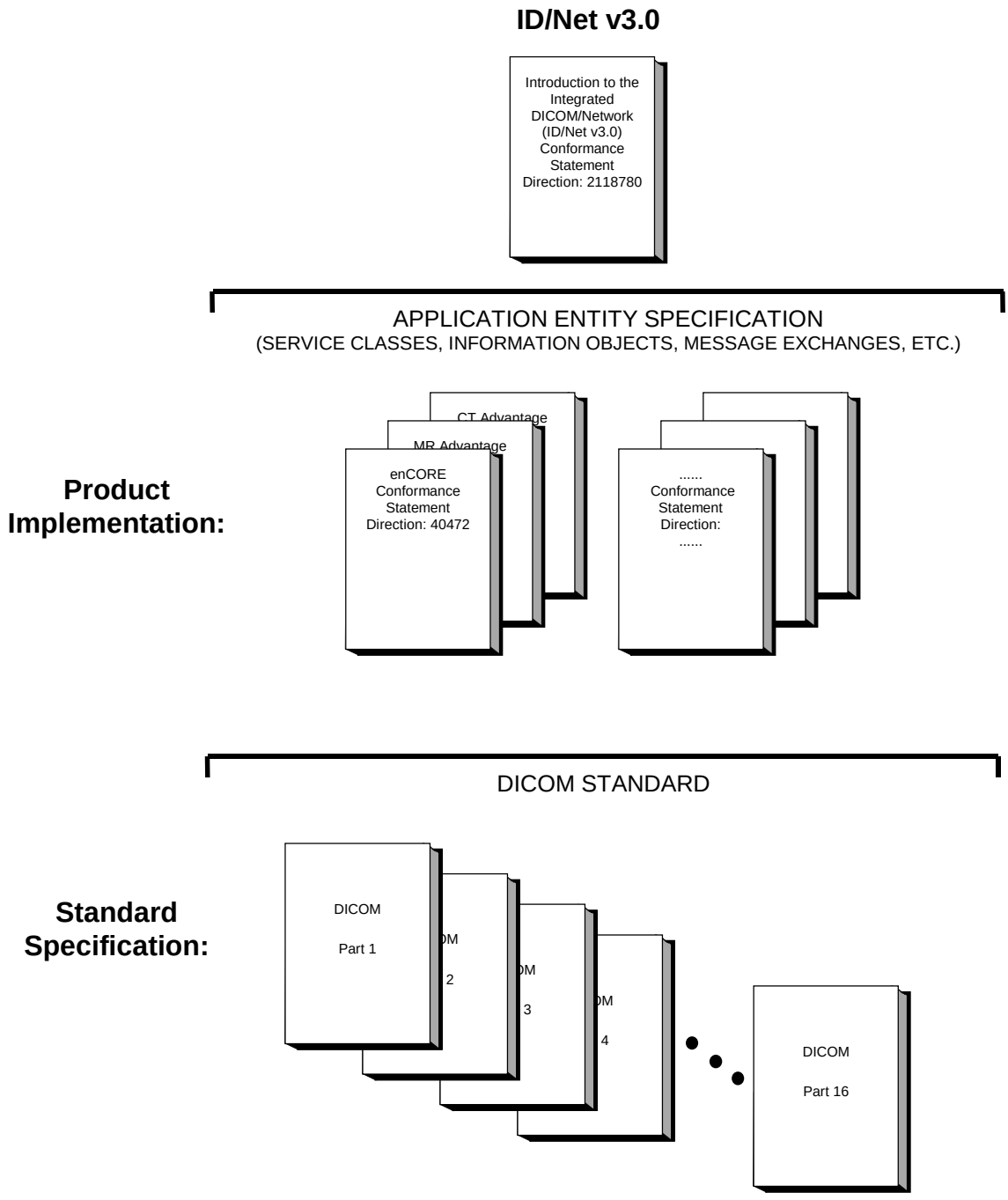
Section 9 (Storage Commitment Push Model SOP Class Definition) specifies the GEMS equipment compliance to DICOM requirements for the implementation of the Storage Commitment Push Model Service.

Section 10 (Enhanced SR Object Implementation) specifies the GEMS equipment compliance to the DICOM requirements for the implementation of Enhanced SR Information Object Implementation feature.

Section 11 (Study Root Query/Retrieve Information Model Definition) specifies the GEMS equipment compliance to the DICOM requirements for the implementation of the Study Root Query/Retrieve Information Model.

1.2 OVERALL DICOM CONFORMANCE STATEMENT DOCUMENT STRUCTURE

The Documentation Structure of the GEMS Conformance Statements and their relationship with the DICOM Conformance Statements is shown in the Illustration below.



This document specifies the DICOM implementation. It is entitled:

enCORE
Conformance Statement for DICOM
Direction 40472

This DICOM Conformance Statement documents the Technical Specification required to interoperate with the GEMS network interface. Introductory information, which is applicable to all GEMS Conformance Statements, is described in the document:

Introduction to the Integrated DICOM/Network v3.0 (ID/Net v3.0)
Conformance Statement
Direction: 2118780.

This Introduction familiarizes the reader with DICOM terminology and general concepts. It should be read prior to reading the individual products' GEMS Conformance Statements.

The GEMS Conformance Statement, contained in this document, also specifies the Lower Layer communications that it supports (e.g., TCP/IP). However, the Technical Specifications are defined in the DICOM Standard Part 8.

For more information including Network Architecture and basic DICOM concepts, please refer to the Introduction.

For the convenience of software developers, there is "collector" Direction available. By ordering the collector, the Introduction described above and all of the currently published GEMS Product Conformance Statements will be received. The collector Direction is:

ID/Net v3.0 Conformance Statements
Direction: 2117016

For more information regarding DICOM, copies of the Standard may be obtained on the Internet at http://medical.nema.org. Comments on the standard may be addressed to:

DICOM Secretariat

NEMA
1300 N. 17th Street, Suite 1847
Rosslyn, VA 22209 USA
Phone: (703) 841-3200

1.3 INTENDED AUDIENCE

The reader of this document is concerned with software design and/or system integration issues. It is assumed that the reader of this document is familiar with the DICOM Standard and with the terminology and concepts that are used in that Standard.

If readers are unfamiliar with DICOM terminology they should first refer to the document listed below, then read the DICOM Standard itself, prior to reading this DICOM Conformance Statement document.

Introduction to the Integrated DICOM/Network v3.0 (ID/Net v3.0)
Conformance Statement
Direction: 2118780

1.4 SCOPE AND FIELD OF APPLICATION

It is the intent of this document, in conjunction with the *Introduction to the Integrated DICOM/Network v3.0 (ID/Net v3.0) Conformance Statement, Direction: 2118780*, to provide an unambiguous specification for GEMS implementations. This specification, called a Conformance Statement, includes a DICOM Conformance Statement and is necessary to ensure proper processing and interpretation of GEMS medical data exchanged using DICOM. The GEMS Conformance Statements are available to the public.

The reader of this DICOM Conformance Statement should be aware that different GEMS devices are capable of using different Information Object Definitions. For example, a GEMS CT Scanner may send images using the CT Information Object, MR Information Object, Secondary Capture Object, etc.

Included in this DICOM Conformance Statement are the Module Definitions which define all data elements used by this GEMS implementation. If the user encounters unspecified private data elements while parsing a GEMS Data Set, the user is well advised to ignore those data elements (per the DICOM Standard). Unspecified private data element information is subject to change without notice. If, however, the device is acting as a "full fidelity storage device", it should retain and re-transmit all of the private data elements which are sent by GEMS devices.

1.5 IMPORTANT REMARKS

The use of these DICOM Conformance Statements, in conjunction with the DICOM Standards is intended to facilitate communication with GE imaging equipment. However, **by itself, it is not sufficient to ensure that inter-operation will be successful**. The **user (or user's agent)** needs to proceed with caution and address at least four issues:

- **Integration** - The integration of any device into an overall system of interconnected devices goes beyond the scope of standards (DICOM), and of this introduction and associated DICOM Conformance Statements when interoperability with non-GE equipment is desired. The responsibility to analyze the applications requirements and to design a solution that integrates GE imaging equipment with non–GE systems is the **user's** responsibility and should not be underestimated. The **user** is strongly advised to ensure that such an integration analysis is correctly performed.

- **Validation** - Testing the complete range of possible interactions between any GE device and non–GE devices, before the connection is declared operational, should not be overlooked. Therefore, the **user** should ensure that any non–GE provider accepts full responsibility for all validation required for their connection with GE devices. This includes the accuracy of the image data once it has crossed the interface between the GE imaging equipment and the non–GE device and the stability of the image data for the intended applications.

  Such a validation is required before any clinical use (diagnosis and/or treatment) is performed. It applies when images acquired on GE imaging equipment are processed/displayed on a non-GE device, as well as when images acquired on non-GE equipment is processed/displayed on a GE console or workstation.

- **Future Evolution** - GE understands that the DICOM Standard will evolve to meet the user's growing requirements. GE is actively involved in the development of the DICOM Standard. DICOM will incorporate new features and technologies and GE may follow the evolution of the Standard. The GEMS protocol is based on DICOM as specified in each DICOM Conformance Statement. Evolution of the Standard may require changes to devices which have implemented DICOM. **In addition, GE reserves the right to discontinue or make changes to the support of communications features (on its products) reflected on by these DICOM Conformance Statements**. The **user** should ensure that any non–GE provider, which connects with GE devices, also plans for the future evolution of the DICOM Standard. Failure to do so will likely result in the loss of function and/or connectivity as the DICOM Standard changes and GE Products are enhanced to support these changes.

- **Interaction** - It is the sole responsibility of the **non–GE provider** to ensure that communication with the interfaced equipment does not cause degradation of GE imaging equipment performance and/or function.

1.6 REFERENCES

A list of references which is applicable to all GEMS Conformance Statements is included in the *Introduction to the Integrated DICOM/Network v3.0 (ID/Net v3.0) Conformance Statement, Direction: 2118780*.

The information object implementation refers to DICOM PS 3.3 (Information Object Definition).

1.7 DEFINITIONS

A set of definitions which is applicable to all GEMS Conformance Statements is included in *the Introduction to the Integrated DICOM/Network v3.0 (ID/Net v3.0) Conformance Statement, Direction: 2118780*.

1.8 SYMBOLS AND ABBREVIATIONS

A list of symbols and abbreviations which is applicable to all GEMS Conformance Statements is included in the *Introduction to the Integrated DICOM/Network v3.0 (ID/Net v3.0) Conformance Statement, Direction: 2118780*.

2. NETWORK CONFORMANCE STATEMENT

2.1 INTRODUCTION

This section of the DICOM Conformance Statement specifies the enCORE compliance to DICOM requirements for **Networking** features. Note that the format of this section strictly follows the format defined in DICOM Standard PS 3.2 (Conformance). Please refer to that part of the standard while reading this section.

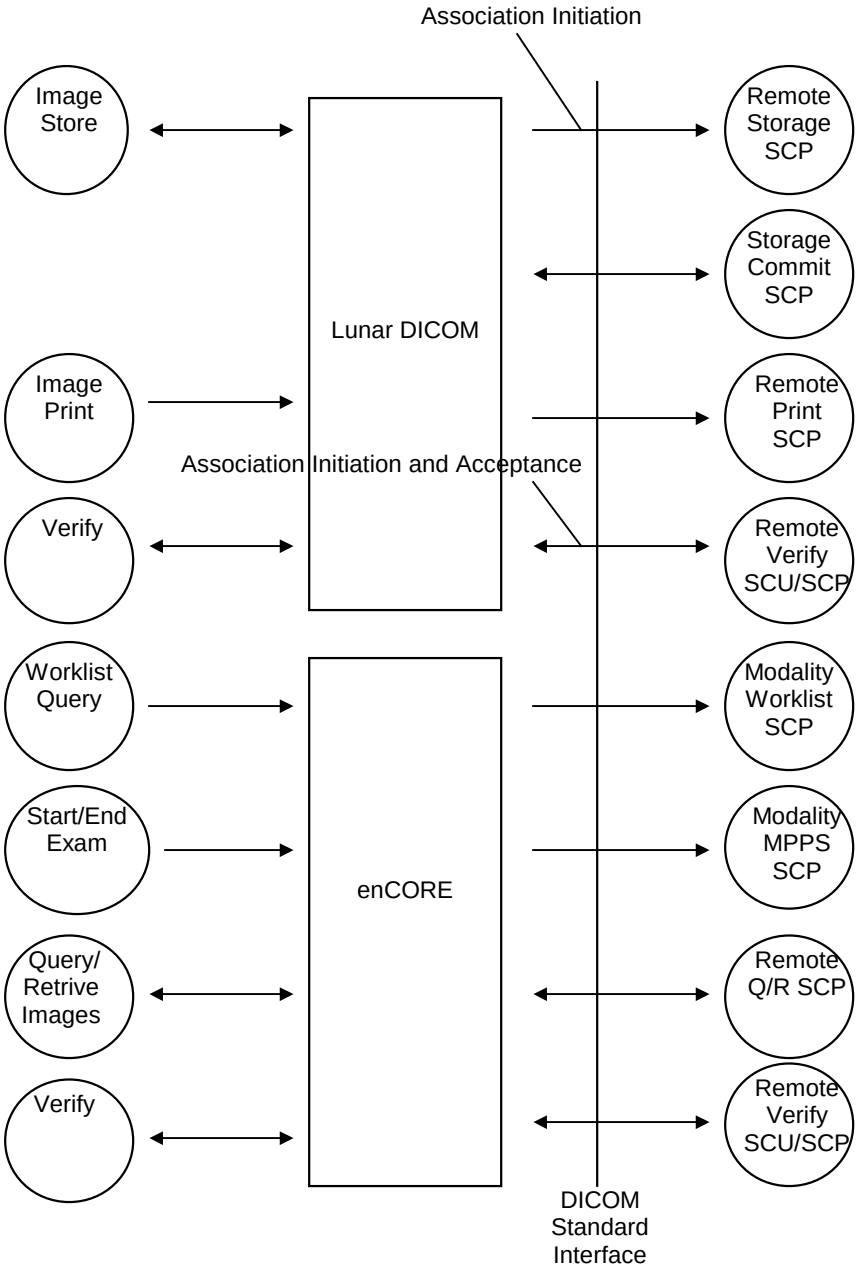
enCORE is the GEMS software running on a commercial computer connected to a DXA scanner. It allows for the following DICOM functionality:

- Storing images, report images, and structured reports to a DICOM Storage SCP
- Sending storage commitment requests to a DICOM Storage Commitment SCP
- Querying and retrieving Modality Worklists from a DICOM Worklist SCP
- Sending exam start and end messages to a DICOM Modality Performed Procedure Step SCP
- Printing images to a DICOM Printer
- Querying and Retrieving images from a DICOM Q/R SCP
- Sending/receiving DICOM verification requests

2.2 IMPLEMENTATION MODEL

2.2.1 Application Data Flow Diagram

The network application model for the enCORE device is shown in the following illustration:



There are six real-world activities that occur in the enCORE DICOM software – **Image Store**, **Image Print**, **Worklist Query**, **Start/End Exam**, **Query/Retrieve Images**, and **Verify**.

Image Store initiates a connection with a DICOM Storage SCP and transmits images, report images, and structured reports to the SCP. If Storage Commitment is configured, a storage commitment request will be sent for the images and reports. All DICOM image transfers are handled in a queued manner by the Lunar DICOM AE. If the network is not connected or the SCP is not running, the images will go into a holding queue. You can configure the application with multiple storage and print devices. Images can be stored to multiple storage devices simultaneously however there can be only one active print device at any one time.

Image Print initiates a connection with a DICOM Print SCP and transmits images to the SCP.

Worklist Query initiates a connection with the DICOM Modality Worklist SCP, performs a query and retrieves and displays the matching entries.

Start/End Exam will send N-CREATE and N-SET messages if Modality Performed Procedure Step is configured.

Query/Retrieve initiates a connection with a DICOM Query/Retrieve SCP and sends a C-FIND-RQ messsage for the user defined search parameters. The user may then select an exam to be retrieved using the C-MOVE-RQ command.

Verify initiates a connection with the DICOM Verify SCP and sends a C-ECHO message. It also responds to incoming verification requests (for service use). A verification test can be initiated at any time by the user to check the current status of any networked DICOM device.

2.2.2 Functional Definition of AEs

enCORE software supports two separate Application Entities – one to store images to a storage device or print images to a remote printer, the other to query a modality worklist provider for a list of exams to perform, signal a performed procedure step at the start and end of an exam, or query/retrieve images from a DICOM archive. Both default to AE title "GELUNAR" however both are configurable.

2.2.3 Sequencing of Real-World Activities

Not Applicable

2.3 AE SPECIFICATIONS

2.3.1 Lunar DICOM AE Specification

The Lunar DICOM Application Entity provides Standard Conformance to the following DICOM SOP Classes as an **SCU**:

SOP Class Name	SOP Class UID
Verification SOP Class	1.2.840.10008.1.1
Computed Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7
Encapsulated PDF Storage	1.2.840.10008.5.1.4.1.1.104.1
Storage Commitment Push Model	1.2.840.10008.1.20.1
Basic Grayscale Print Management Meta SOP Class	1.2.840.10008.5.1.1.9
Enhanced SR Storage	1.2.840.10008.5.1.4.1.1.88.22

2.3.1.1 Association Establishment Policies

2.3.1.1.1 General

The DICOM Application Context Name (ACN), which is always proposed, is:

Application Context Name	1.2.840.10008.3.1.1.1

The maximum length PDU receive size for the Lunar DICOM AE is:

Maximum Length PDU	16384 bytes

2.3.1.1.2 Number of Associations

The Lunar DICOM AE will initiate a single association at a time to remote nodes.

2.3.1.1.3 Asynchronous Nature

Asynchronous mode is not supported. All operations will be performed synchronously.

2.3.1.1.4 Implementation Identifying Information

The Implementation UID for this DICOM Implementation is:

Lunar DICOM Implementation UID	1.2.840.113619.6.110

The Implementation Version Name for this DICOM Implementation is:

LUNAR DICOM Implementation Version Name	LNRDCM12.00.005

2.3.1.2 Association Initiation Policy

The Lunar DICOM AE proposes only a single Transfer Syntax in each Presentation Context; i.e., for each Abstract Syntax in the following Presentation Context Tables, the AE proposes one Presentation Context for each specified Transfer Syntax.

2.3.1.2.1 Real-World Activity Image Store

2.3.1.2.1.1 Associated Real-World Activity

Upon a request from the user, an image, report image, or structured report will be sent (manual or automatic) to a previously configured DICOM Storage SCP. This operation also sends a storage commitment request (if so configured). The storage commitment result from the SCP is expected on another association.

If an error occurs during the transmission, the current association is released. A failed job can be manually retried by highlighting the queued job(s) to be retried and selecting the “Retry Selected Jobs” option off the File menu.

A DICOM Storage SCP may be selected as the enCORE file archive. In this case, private attributes to store the raw enCORE data are added to the DICOM file. These files can be restored later using Query/Retrieve.

2.3.1.2.1.2 Proposed Presentation Context Table

Presentation Context Table – Proposed by AE Lunar DICOM for Activity Image Store					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name List**	**UID List**		
Computed Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCU	None
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCU	None
Encapsulated PDF Storage	1.2.840.10008.5.1.4.1.1.104.1	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCU	None
Storage Commitment Push Model	1.2.840.10008.1.20.1	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCU	None
Enhanced SR	1.2.840.10008.5.1.4.1.1.88.11	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCU	None

2.3.1.2.1.2.1 SOP Specific DICOM Conformance Statement for all Storage SOP Classes

Following are the status codes that are more specifically processed when receiving messages from **Storage** SCP equipment:

Service Status	Status Codes	Further Meaning	Application Behavior When receiving Status Codes	Related Fields Processed if received
Refused	A7xx	Out of resources	Logs store failed message along with error comment returned from SCP. Displays store failure message and moves on to next job.	(0000,0902)
	A800	SOP Class not Supported	Logs store failed message along with error comment returned from SCP. Displays store failure message and moves on to next job.	(0000,0902)
Error	Cxxx	Cannot Understand	Logs store failed message along with list of offending elements and any error comments returned from SCP. Displays store failure message and moves on to next job.	(0000,0901) (0000,0902)
	A9xx	Data Set does not match SOP Class	Logs store failed message along with list of offending elements and any error comments returned from SCP. Displays store failure message	(0000,0901) (0000,0902)

			and moves on to next job.	
	D000	Duplicate SOP Instance UID	Logs store failed message along with list of offending elements and any error comments returned from SCP. Displays store failure message and moves on to next job.	(0000,0901) (0000,0902)
Warning	B000	Coercion of Data Elements	Ignored	(0000,0901) (0000,0902)
	B007	Data Set does not match SOP Class	Ignored	(0000,0901) (0000,0902)
	B006	Elements Discarded	Ignored	(0000,0901) (0000,0902)
Success	0000			None

2.3.1.2.1.2.2 SOP Specific DICOM Conformance Statement for the Enhanced Structured Reporting Storage SOP Classes

See Section 2.3.1.2.1.2.1 "SOP Specific DICOM Conformance Statement for All Storage SOP Classes" for details on general Storage Service SCU processing also applicable to the Structured Reporting Storage SOP Class.

The Lunar DICOM AE supports creation and transmission of Structured Reporting SOP Instances referencing Instances of the following Storage SOP Classes:

SOP Class Name	SOP Class UID
Enhanced SR Storage	1.2.840.10008.5.1.4.1.1.88.22

2.3.1.2.2 Real-World Activity Image Print

2.3.1.2.2.1 Associated Real-World Activity

Upon a request from the user, an image will be sent to a previously configured DICOM printer SCP. If an error occurs during the transmission, the current association is released. A failed job can be manually retried by highlighting the queued job(s) to be retried and selecting the "Retry Selected Jobs" option off the File menu.

2.3.1.2.2.2 Proposed Presentation Context Table

Presentation Context Table – Proposed by AE Lunar DICOM for Activity Image Print					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended**
Name	**UID**	**Name List**	**UID List**		**Negotiation**
Basic Grayscale Print Management Meta SOP Class	1.2.840.10008.5.1.1.9	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCU	None
Printer SOP Class	1.2.840.10008.5.1.1.16	Implicit VR Little Endian Explicit VR Little Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1	SCU	None

		Explicit VR Big Endian	1.2.840.10008.1.2.2		

2.3.1.2.2.2.1 SOP Specific DICOM Conformance Statement for all Print SOP Classes

Following are the status codes that are more specifically processed when receiving messages from **Print** SCP equipment:

Service Status	Status Codes	Further Meaning	Application Behavior When receiving Status Codes	Related Fields Processed if received
Refused	A7xx	Out of resources	Displays print failure message and moves on to next job.	None
	0122	SOP Class not Supported	Displays print failure message and moves on to next job.	None
Error	Cxxx	Cannot Understand	Displays print failure message and moves on to next job.	None
	A9xx	Data Set does not match SOP Class	Displays print failure message and moves on to next job.	None
Warning	B000	Coercion of Data Elements	Logs any comments returned from SCP and moves on to next job.	None
	B007	Data Set does not match SOP Class	Logs any comments returned from SCP and moves on to next job.	None
	B006	Elements Discarded	Logs any comments returned from SCP and moves on to next job.	None
Success	0000			None

2.3.1.2.3 Real-World Activity Verify

2.3.1.2.3.1 Associated Real-World Activity

The Verification Service Class is used as a diagnostic and informative tool to provide information to the user regarding the current connection status of other networked DICOM devices. If the device is a printer, printer attributes are also retrieved and displayed using the N-GET command. When selected by the user, the remote device will be tested with a DICOM C-ECHO command. The results of the C-ECHO are displayed on the screen. Associations will be released upon the receipt of a C-ECHO confirmation or time out in the event that the SCP does not respond. Each networked DICOM device is verified individually. The table below lists all possible proposed SOP classes when a verification association is opened. Store SOPs are only offered when verifying a storage device and print SOPs are only offered when verifying a print device.

2.3.1.2.3.2 Proposed Presentation Context Table

Presentation Context Table – Proposed by AE Lunar DICOM for Activity Echo Test

Abstract Syntax		Transfer Syntax		Role	Extended
Name	**UID**	**Name List**	**UID List**		**Negotiation**
Verification SOP Class	1.2.840.10008.1.1	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCU	None
Computed Radiography Image Storage	1.2.840.10008.5.1.4.1.1.1	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCU	None
Secondary Capture Image Storage	1.2.840.10008.5.1.4.1.1.7	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCU	None
Encapsulated PDF Storage	1.2.840.10008.5.1.4.1.1.104.1	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCU	None
Enhanced SR Storage	1.2.840.10008.5.1.4.1.1.88.22	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCU	None
Storage Commitment Push	1.2.840.10008.1.20.1	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCU	None
Basic Grayscale Print Management Meta SOP Class	1.2.840.10008.5.1.1.9	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCU	None

2.3.1.3 Association Acceptance Policy

2.3.1.3.1 Real-World Activity Image Storage Commitment

2.3.1.3.1.1 Associated Real-World Activity

An incoming Storage Commitment Result Request will cause the Lunar DICOM AE to accept the association and respond with an appropriate response.

2.3.1.3.1.2 Accepted Presentation Context Table

Presentation Context Table – Accepted by AE Lunar DICOM for Activity Image Store Commit					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended**
Name	**UID**	**Name List**	**UID List**		**Negotiation**
Storage Commitment Push Model	1.2.840.10008.1.20.1	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCU	None

2.3.1.3.1.2.1 SOP Specific DICOM Conformance Statement for the Storage Commitment Push Model SOP Class

The Lunar DICOM AE will only accept the SCU role (which must be proposed via SCP/SCU Role Selection Negotiation) within a Presentation Context for the Storage Commitment Push Model SOP Class.

Upon receiving a Storage Commitment N-EVENT-REPORT (Storage Commitment Result), the Lunar DICOM AE will return a Success status.

2.3.1.3.1.3 Presentation Context Acceptance Criterion

No criterion.

2.3.1.3.1.4 Transfer Syntax Selection Policies

The selected transfer syntax is based on the proposed transfer syntax list. The priority order is Implicit VR Little Endian, Explicit VR Little Endian, Explicit VR Big Endian.

2.3.2 enCORE AE Specification

The enCORE Application Entity provides Standard Conformance to the following DICOM SOP Classes as an **SCU**:

SOP Class Name	SOP Class UID
Verification SOP Class	1.2.840.10008.1.1
Modality Worklist Information Model – FIND	1.2.840.10008.5.1.4.31
Modality Performed Procedure Step	1.2.840.10008.3.1.2.3.3
Study Root Query/Retrieve Information Model – FIND	1.2.840.10008.1.5.1.4.1.2.2.1
Study Root Query/Retrieve Information Model – MOVE	1.2.840.10008.1.5.1.4.1.2.2.2

This Application Entity provides Standard Conformance to the following DICOM SOP Classes as an **SCP**:

SOP Class Name	SOP Class UID
Verification SOP Class	1.2.840.10008.1.1

2.3.2.1 Association Establishment Policies

2.3.2.1.1 General

The DICOM Application Context Name (ACN), which is always proposed, is:

Application Context Name	1.2.840.10008.3.1.1.1

The maximum length PDU receive size for the enCORE AE is configurable. The possible values are:

Maximum Length PDU	16384 - 131072 bytes

2.3.2.1.2 Number of Associations

The enCORE AE will initiate a single association at a time to remote nodes.

2.3.2.1.3 Asynchronous Nature

Asynchronous mode is not supported. All operations will be performed synchronously.

2.3.2.1.4 Implementation Identifying Information

The Implementation UID for this DICOM Implementation is:

EnCORE Implementation UID	1.2.840.113619.6.110

The Implementation Version Name for this DICOM Implementation is:

enCORE Implementation Version Name	ENCORE12.00.234

2.3.2.2 Association Initiation Policy

The enCORE AE proposes only a single Transfer Syntax in each Presentation Context; i.e., for each Abstract Syntax in the following Presentation Context Tables, the AE proposes one Presentation Context for each specified Transfer Syntax.

2.3.2.2.1 Real-World Activity Query Worklist

2.3.2.2.1.1 Associated Real-World Activity

Upon a request from the user, the Worklist SCP will be queried for the worklist items that match the currently selected user-defined query. The association will be released upon the receipt of the C-FIND-RSP confirmation.

2.3.2.2.1.2 Proposed Presentation Context Table

Presentation Context Table – Proposed by AE enCORE for Activity Query Worklist					
Abstract Syntax		Transfer Syntax		Role	Extended Negotiation
Name	UID	Name List	UID List		
Modality Worklist Information Model - FIND	1.2.840.10008.5.1.4.31	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCU	None

2.3.2.2.1.2.1 SOP Specific DICOM Conformance Statement for the Modality Worklist Information Model - FIND SOP Class

The enCORE AE includes matching keys in the Modality Worklist queries as described in Section 6.5.

The user can select an item from the returned worklist and click the More Info button to view the query response information.

A C-FIND CANCEL message is sent if the user clicks the Cancel button during the query.

Following are the status codes that are more specifically processed when receiving messages from **Modality Worklist** SCP equipment:

Service Status	Status Codes	Further Meaning	Application Behavior When receiving Status Codes	Related Fields Processed if received
Refused	A700	Out of resources	Terminates the association and operation. Logs failure message along with error comment returned from SCP and displays failure message. The matches that are received prior to this code are handled normally.	(0000,0902)
	0122	SOP Class not Supported	Terminates the association and operation. Logs failure message along with error comment returned from SCP and displays failure message. The matches that are received prior to this code are handled normally.	(0000,0902)
Failed	A900	Identifier does not match SOP Class	Terminates the association and operation. Logs failure message along with offending element and any error comment returned from SCP and displays failure message. The matches that are received prior to this code are handled normally.	(0000,0901) (0000,0902)
	Cxxx	Unable to process	Terminates the association and operation. Logs failure message along with offending element and any error comment returned from SCP and displays failure message. The matches that are received prior to this code are handled normally.	(0000,0901) (0000,0902)
Cancel	FE00	Matching terminated due to cancel	Terminates the association and operation.. Logs SCP cancel message and displays failure message. Any matches received prior to this code are thrown away.	None
Success	0000	Matching is complete - No final identifier is supplied		None
Pending	FF00	Matches are continuing - Current Match is supplied and any Optional Keys were supported in the same manner as Required Keys.	Receiving of matches continues.	None

	FF01	Matches are continuing - Warning that one or more Optional Keys were not supported for existence for this Identifier	Receiving of matches continues without any warnings or errors.	None

2.3.2.2.2 Real-World Activity Start/End Exam

2.3.2.2.2.1 Associated Real-World Activity

The Modality Performed Procedure Step N-CREATE is sent with status of "IN PROGRESS" when a measurement is initiated by the operator. The Modality Performed Procedure Step N-SET is sent with status of "COMPLETED" when the exam is completed (all images acquired). If the exam is aborted, a status of "DISCONTINUED" is sent.

2.3.2.2.2.2 Proposed Presentation Context Table

Presentation Context Table – Proposed by AE enCORE for Activity Start/End Exam					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name List**	**UID List**		
Modality Performed Procedure Step	1.2.840.10008.3.1.2.3.3	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCU	None

2.3.2.2.2.2.1 SOP Specific DICOM Conformance Statement for the Modality Performed Procedure Step SOP Class

The enCORE AE includes attributes in the Modality Performed Procedure Step N-CREATE and N-SET as described in Section 7.5.

Following are the status codes that are more specifically processed when receiving messages from **Performed Procedure Step** SCP equipment:

Service Status	Status Codes	Further Meaning	Application Behavior When receiving Status Codes	Related Fields Processed if received
Refused	A7xx	Out of resources	Logs failure message along with error comment returned from SCP.	(0000,0902)
	0122	SOP Class not Supported	Logs failure message along with error comment returned from SCP.	(0000,0902)
Error	Cxxx	Cannot Understand	Logs failure message along with list of offending elements and any error comment returned from SCP.	(0000,0901) (0000,0902)

	A9xx	Data Set does not match SOP Class	Logs failure message along with offending element and any error comment returned from SCP.	(0000,0901) (0000,0902)
Warning	B000	Coercion of Data Elements	Logs list of offending elements and any comments returned from SCP.	(0000,0901) (0000,0902)
	B007	Data Set does not match SOP Class	Logs list of offending elements and any comments returned from SCP.	(0000,0901) (0000,0902)
	B006	Elements Discarded	Logs list of offending elements and any comments returned from SCP.	(0000,0901) (0000,0902)
Success	0000			None

2.3.2.2.3 Real-World Activity Query/Retrieve

2.3.2.2.3.1 Associated Real-World Activity

The DICOM Query/Retrieve service can be used to restore enCORE data files previously archived to a DICOM Storage SCP.

Upon a request from the user, a C-FIND-RQ command will be issued to the Query/Retrieve SCP to query for exams that match the user-defined query crtieria. The association will be released upon the receipt of the C-FIND-RSP confirmation. To retrieve an exam, the user can either use the information returned from a query or the information stored in the local enCORE database when the exam was archived. The C-MOVE-RQ command is used to retrieve the exam from the Query/Retrieve SCP. The C-STORE-RQ from the SCP is expected on another association.

After a DICOM file is retrieved, the private enCORE attributes are extracted (if present) and the scan is restored onto the local system.

2.3.2.2.3.2 Proposed Presentation Context Table

Presentation Context Table – Proposed by AE enCORE for Activity Query/Retrieve					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended Negotiation**
Name	**UID**	**Name List**	**UID List**		
Study Root Query/Retrieve Information Model – FIND	1.2.840.10008.5.1.4.1.2.2.1	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Explicit VR Big Endian	1.2.840.10008.1.2.2		
Study Root Query/Retrieve Information Model – MOVE	1.2.840.10008.5.1.4.1.2.2.2	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None
		Explicit VR Little Endian	1.2.840.10008.1.2.1		
		Explicit VR Big Endian	1.2.840.10008.1.2.2		

2.3.2.2.3.2.1 SOP Specific DICOM Conformance Statement for the Study Root Query/Retrieve Information Model - FIND SOP Class

The enCORE AE includes matching keys in the queries as described in Section 10.4.2.

A C-FIND CANCEL message is sent if the user clicks the Cancel button during the query.

Following are the status codes that are more specifically processed when receiving messages from **Query/Retrieve** SCP equipment:

Service Status	Status Codes	Further Meaning	Application Behavior When receiving Status Codes	Related Fields Processed if received
Failure	A700	Refused: Out of resources	Terminates the association and operation. Logs failure message along with error comment returned from SCP and displays failure message. The matches that are received prior to this code are handled normally.	(0000,0902)
	A900	Identifier does not match SOP Class	Terminates the association and operation. Logs failure message along with offending element and any error comment returned from SCP and displays failure message. The matches that are received prior to this code are handled normally.	(0000,0901) (0000,0902)
	Cxxx	Unable to process	Terminates the association and operation. Logs failure message along with offending element and any error comment returned from SCP and displays failure message. The matches that are received prior to this code are handled normally.	(0000,0901) (0000,0902)
Cancel	FE00	Matching terminated due to Cancel request	Terminates the association and operation.. Logs SCP cancel message and displays failure message. Any matches received prior to this code are thrown away.	None
Success	0000	Matching is complete - No final identifier is supplied		None
Pending	FF00	Matches are continuing - Current Match is supplied and any Optional Keys were supported in the same manner as Required Keys.	Receiving of matches continues.	None
	FF01	Matches are continuing - Warning that one or more Optional Keys were not supported for existence for this Identifier	Receiving of matches continues without any warnings or errors.	None

2.3.2.2.3.2.2 SOP Specific DICOM Conformance Statement for the Study Root Query/Retrieve Information Model - MOVE SOP Class

A C-FIND CANCEL message is sent if the user clicks the Cancel button during the move.

Following are the status codes that are more specifically processed when receiving messages from **Query/Retrieve** SCP equipment:

Service Status	Status Codes	Further Meaning	Application Behavior When receiving Status Codes	Related Fields Processed if received
Failure	A701	Refused: Out of resources – Unable to calculate number of matches	Terminates the association and operation. Logs failure message along with error comment returned from SCP and displays failure message. The matches that are received prior to this code are handled normally.	(0000,0902)
	A702	Refused: Out of resources – Unable to perform sub-operations	Terminates the association and operation. Logs failure message along with error comment returned from SCP and displays failure message. The matches that are received prior to this code are handled normally.	(0000,1020) (0000,1021) (0000,1022) (0000,1023)
	A801	Refused: Move Destination unknonw		(0000,0902)
	A900	Identifier does not match SOP Class	Terminates the association and operation. Logs failure message along with offending element and any error comment returned from SCP and displays failure message. The matches that are received prior to this code are handled normally.	(0000,0901) (0000,0902)
	Cxxx	Unable to Process		(0000,0901) (0000,0902)
Cancel	FE00	Sub-operations terminated due to Cancel Indication		(0000,1020) (0000,1021) (0000,1022) (0000,1023)
Warning	B000	Sub-operations Complete – One or more Failures		(0000,1020) (0000,1022) (0000,1023)
Success	0000	Sub-operations Complete – No Failures		(0000,1020) (0000,1021) (0000,1022) (0000,1023)
Pending	FF00	Sub-operations are continuing		(0000,1020) (0000,1021) (0000,1022) (0000,1023)

2.3.2.2.4 Real-World Activity Verify

2.3.2.2.4.1 Associated Real-World Activity

The Verification Service Class is used as a diagnostic and informative tool to provide information to the user regarding the current connection status of other networked DICOM devices. When selected by the user, the remote device will be tested with a DICOM C-ECHO command. The results of the C-ECHO are displayed on the screen. Associations will be released upon the receipt of a C-ECHO confirmation. Each networked DICOM device is verified individually. The table below lists all the possible proposed SOP classes when a verification association is opened however only the Verification SOP class and the SOP class of the DICOM service being verified are actually proposed. Worklist SOPs are only offered when verifying a worklist provider, performed procedure step SOPs are only offered when verifying a procedure step provider.

2.3.2.2.4.2 Proposed Presentation Context Table

Presentation Context Table – Proposed by AE enCORE for Activity Echo Test					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended**
Name	**UID**	**Name List**	**UID List**		**Negotiation**
Verification SOP Class	1.2.840.10008.1.1	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCU	None
Modality Worklist Information Model – FIND	1.2.840.10008.5.1.4.31	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCU	None
Modality Performed Procedure Step	1.2.840.10008.3.1.2.3.3	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCU	None

2.3.2.3 Association Acceptance Policy

2.3.2.3.1 Real-World Activity Verify

2.3.2.3.1.1 Associated Real-World Activity

The enCORE AE accepts any incoming verification request from the configured Worklist and MPPS SCPs and responds with a verification response.

2.3.2.3.1.2 Accepted Presentation Context Table

Presentation Context Table – Accepted by AE enCORE for Activity Echo Test					
Abstract Syntax		**Transfer Syntax**		**Role**	**Extended**
Name	**UID**	**Name List**	**UID List**		**Negotiation**

Verification SOP Class	1.2.840.10008.1.1	Implicit VR Little Endian Explicit VR Little Endian Explicit VR Big Endian	1.2.840.10008.1.2 1.2.840.10008.1.2.1 1.2.840.10008.1.2.2	SCP	None

2.3.2.3.1.2.1 SOP Specific DICOM Conformance Statement for Verify SOP Class

The enCORE AE provides standard conformance to the Verification SOP Class as an SCP. The port number is 104.

2.3.2.3.1.3 Presentation Context Acceptance Criterion

No criterion.

2.3.2.3.1.4 Transfer Syntax Selection Policies

The selected transfer syntax is based on the proposed transfer syntax list. The priority order is Implicit VR Little Endian, Explicit VR Little Endian, Explicit VR Big Endian.

2.4 COMMUNICATION PROFILES

2.4.1 Supported Communication Stacks

DICOM Upper Layer Protocol is supported using TCP/IP, as specified in DICOM PS3.8.

The TCP/IP stack is inherited from the Windows Operating System.

2.4.2 Physical Media Support

The product is provided with a 10/100Mb/s auto-sensing Ethernet interface. Additional or alternate network interfaces may be available.

2.5 EXTENSIONS / SPECIALIZATIONS / PRIVATIZATIONS

2.5.1 Standard Extended /Specialized/Private SOPs

2.5.1.1 Extended Enhanced SR object

The extension of this SOP Class is described in section 9 - ENHANCED SR INFORMATION OBJECT IMPLEMENTATION.

2.6 CONFIGURATION

2.6.1 AE Title/Presentation Address Mapping

The local AE titles are configurable and are normally setup by a GEMS service engineer during DICOM software installation. They can be modified by the user if the need arises.

2.6.2 Configurable Parameters

The following fields are configurable for this AE (local):

- Local AE Title (default is GELUNAR)
- Local IP Address
- Local IP Netmask
- Local Modality (default is OT)
- Association Establishment Timer (default is 30 sec)
- Maximum Length PDU (default is 16384)
- Read Timeout (default is 15 sec)
- Write Timeout (default is 15 sec)
- Storage Commitment port for receiving N-EVENT-REPORT commands from a Storage Commitment SCP(default is 2800).
- Store port for receiving images as a result of a Q/R C-MOVE-RQ (default is 104).
- Worklist query fields and values
- Modality Performed Procedure Step fields
- Query/Retrieve fields and values.

The following fields are configurable for every remote DICOM Storage AE:

- AE Title
- IP Address
- TCP/IP Port Number
- Storage Commitment AE Title
- Storage Commitment TCP/IP Port Number
- Query/Retrieve AE Title
- Query/Retrieve TCP/IP Port Number
- RGB, Palette Color, or Monochrome images (default is Palette Color)

The following additional fields are configurable for every remote DICOM Print AE:

- AE Title
- IP Address
- TCP/IP Port Number
- Printer gamma correction (default is 1)
- Printer film size (8X10 or 14X17)

2.7 SUPPORT OF EXTENDED CHARACTER SETS

The user can configure the Lunar DICOM application to use extended character sets. If extended character sets

are not used, the default ISO-IR 6 character set will be used. The following extended character sets are supported for the storage SOP classses:

ISO_IR 100 Latin 1
ISO_IR 101 Latin 2
ISO_IR 110 Latin 4
ISO_IR 126 Greek
ISO_IR 127 Arabic
ISO_IR 138 Hebrew
ISO_IR 144 Cyrillic
ISO_IR 148 Latin 5
ISO 2022 IR 87 (JIS X 0208: Kanji)

2.8 CODES AND CONTROLLED TERMINOLOGY

2.8.1 Fixed Coded Terminology

The product uses the fixed (non-configurable, non-extensible) coded terminology in SR Document attributes, as described in Section 9 ENHANCED SR INFORMATION OBJECT IMPLEMENTATION.

2.8.2 Mapped Coded Terminology

The product maps, without change, coded terminology values supplied in Modality Worklist Scheduled Procedure Steps into Image SOP Instance and Modality Performed Procedure Step attributes, as described in Sections 6 MODALITY WORKLIST INFORMATION MODEL DEFINITION and 7 MODALITY PERFORMED PROCEDURE STEP SOP CLASS DEFINITION.

2.8.3 Configurable Coded Terminology

The product allows configuration of the following sets of coded terminology:

Context Group	Default Value Set	Use
Acquisition Protocol Equipment Settings	None	Value of Requested Procedure Code Sequence (0032,1064) and Scheduled Protocol Code Sequence (0040,0008) from selected Modality Worklist Scheduled Procedure Step are matched to this group for protocol-assisted equipment set-up. Selected value from this group is used in Modality Performed Procedure Step Procedure Code Sequence (0008,1032) and Modality Performed Procedure Step Performed Protocol Code Sequence (0040,0260)
Patient Demographics	M, F White, Black, Hispanic, Asian, Other	Value of Patient's Sex (0010,0040) and Ethnic Group (0010,2160) from Modality Worklist are matched to this group for worklist-assisted patient demographic input. Selected value from this group is used in Modality Performed Procedure Step and the Image SOP Instance Patient's Demographic Module.

Procedures for configuring these Context Groups are found in the product Service Manual.

2.9 SECURITY PROFILES

The product does not conform to any defined DICOM Security Profiles.

It is assumed that the product is used within a secured environment. It is assumed that a secured environment includes at a minimum:

1. Firewall or router protections to ensure that only approved external hosts have network access to the product.
2. Firewall or router protections to ensure that the product only has network access to approved external hosts and services.

Any communications with external hosts and services outside the locally secured environment use appropriate secure network channels (such as a Virtual Private Network (VPN))

3. SC INFORMATION OBJECT IMPLEMENTATION

3.1 INTRODUCTION

This section specifies the use of the DICOM SC Image IOD to represent the information included in SC images produced by this implementation. Corresponding attributes are conveyed using the module construct. SC images are generated for enCORE report images that are sent to PACS. The contents of this section are:

3.2 - IOD Description

3.3 - IOD Entity-Relationship Model

3.4 - IOD Module Table

3.5- IOD Module Definition

3.2 SC IOD IMPLEMENTATION

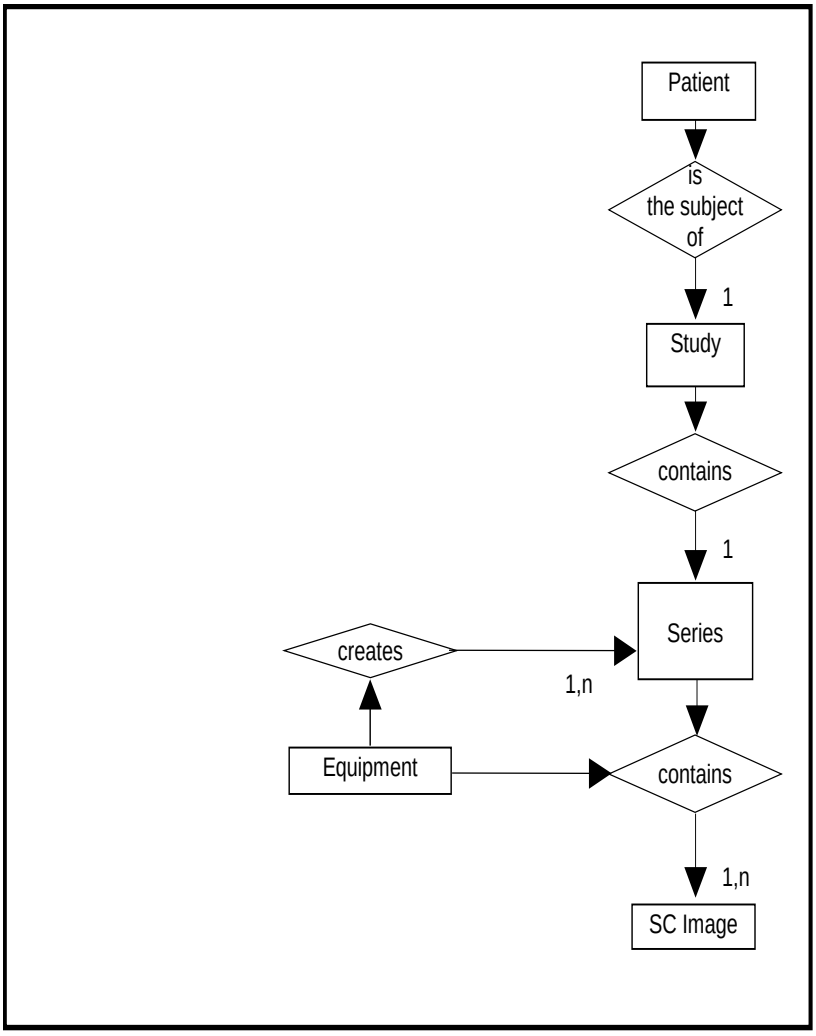
3.3 SC ENTITY-RELATIONSHIP MODEL

The Entity-Relationship diagram for the SC Image interoperability schema is shown in Illustration 3.3-1**.** In this figure, the following diagrammatic convention is established to represent the information organization:

- each entity is represented by a rectangular box
- each relationship is represented by a diamond shaped box
- the fact that a relationship exists between two entities is depicted by lines connecting the corresponding entity boxes to the relationship boxes

The relationships are fully defined with the maximum number of possible entities in the relationship shown.

ILLUSTRATION 3.3-1
SC IMAGE ENTITY RELATIONSHIP DIAGRAM



3.3.1 ENTITY DESCRIPTIONS

Please refer to DICOM Standard Part 3 (Information Object Definitions) for a description of each of the entities contained within the SC Information Object.

3.3.2 enCORE Mapping of DICOM entities

TABLE 3.3-1
MAPPING OF DICOM ENTITIES TO enCORE ENTITIES

DICOM	enCORE Entity
Patient	Patient
Study	Exam
Series	Series
Image	Image
Frame	Not Applicable

3.4 IOD MODULE TABLE

Within an entity of the DICOM SC IOD, attributes are grouped into related set of attributes. A set of related attributes is termed a module. A module facilitates the understanding of the semantics concerning the attributes and how the attributes are related with each other. A module grouping does not infer any encoding of information into datasets.

Table 3.4-1 identifies the defined modules within the entities which comprise the DICOM SC IOD. Modules are identified by Module Name.

See the DICOM Standard Part 3 for a complete definition of the entities, modules, and attributes.

TABLE 3.4-1
SC IMAGE IOD MODULES

Entity Name	Module Name	Reference
Patient	Patient	3.5.1.1
Study	General Study	3.5.2.1
	Patient Study	3.5.2.2
Series	General Series	3.5.3.1
Equipment	General Equipment	3.5.4.1
	SC Equipment	3.5.7.1
Image	General Image	3.5.5.1
	Image Pixel	3.5.5.2
	SC Image	3.5.7.2
	Overlay Plane	Not used
	Modality LUT	Not used
	VOI LUT	Not used
	SOP Common	3.5.6.1

3.5 INFORMATION MODULE DEFINITIONS

Please refer to DICOM Standard Part 3 (Information Object Definitions) for a description of each of the entities and modules contained within the SC Information Object.

The following modules are included to convey Enumerated Values, Defined Terms, and Optional Attributes supported. Type 1 & Type 2 Attributes are also included for completeness and to define what values they may take and where these values are obtained from. It should be noted that they are the same ones as defined in the DICOM Standard Part 3 (Information Object Definitions).

3.5.1 Common Patient Entity Modules

3.5.1.1 Patient Module

This section specifies the Attributes of the Patient that describe and identify the Patient who is the subject of a diagnostic Study. This Module contains Attributes of the patient that are needed for diagnostic interpretation of the Image and are common for all studies performed on the patient.

TABLE 3.5-1
PATIENT MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Patient's Name	(0010,0010)	2	Patient name from Worklist SCP or user interface. The user interface allows the user to enter up to 52 characters for last name, 34 characters for first name, and 1 character for middle initial however only the first 64 characters will be used.
Patient ID	(0010,0020)	2	Patient ID from Worklist SCP or user interface. The user interface allows the user to enter up to 64 characters.
Patient's Birth Date	(0010,0030)	2	Patient birth date from Worklist SCP or user interface.
Patient's Sex	(0010,0040)	2	Patient sex from Worklist SCP or Gender from user interface. HIS codes can be mapped to enCore codes (Female, Male)
Referenced Patient Sequence	(0008,1120)	3	Not used
>Referenced SOP Class UID	(0008,1150)	1C	
>Referenced SOP Instance UID	(0008,1155)	1C	
Patient's Birth Time	(0010,0032)	3	Not used
Other Patient Ids	(0010,1000)	3	Used only if received from Worklist SCP.
Other Patient Names	(0010,1001)	3	Not used
Ethnic Group	(0010,2160)	3	Ethnic group from Worklist SCP or ethnicity from user interface. HIS codes can be mapped to enCore codes (White, Black, Asian, Hispanic, Other)
Patient Comments	(0010,4000)	3	Patient comments from Worklist SCP or user interface. The user interface will allow the user to enter up to 256 characters. If received from the Worklist SCP, up to 10240 characters will be accepted, but only the first 256 characters will be displayed and stored to the image file.

3.5.2 Common Study Entity Modules

The following Study IE Modules are common to all Composite Image IODs which reference the Study IE. These Modules contain Attributes of the patient and study that are needed for diagnostic interpretation of the image.

3.5.2.1 General Study Module

This section specifies the Attributes which describe and identify the Study performed upon the Patient.

TABLE 3.5-2
GENERAL STUDY MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Study Instance UID	(0020,000D)	1	Uniquely identifies a study. Study Instance UID from Worklist SCP or internally generated.
Study Date	(0008,0020)	2	Date of exam.
Study Time	(0008,0030)	2	Time of exam.
Referring Physician's Name	(0008,0090)	2	Referring physician from Worklist SCP or Physician from user interface. The user interface allows the user to enter up to 64 characters.
Study ID	(0020,0010)	2	Requested Procedure ID from Worklist SCP or internally generated.
Accession Number	(0008,0050)	2	Accession number from Worklist SCP or Exam ID from user interface.
Study Description	(0008,1030)	3	User configurable. Can be mapped to either MPPS Performed Procedure Step Description or MWL Requested Procedure Description. If MPPS or MWL not used, set to "DXA <exam type>".
Physician(s) of Record	(0008,1048)	3	Not used
Name of Physician(s) Reading Study	(0008,1060)	3	Not used
Referenced Study Sequence	(0008,1110)	3	Used only if received from Worklist SCP.
>Referenced SOP Class UID	(0008,1150)	1C	Used only if received from Worklist SCP.
>Referenced SOP Instance UID	(0008,1155)	1C	Used only if received from Worklist SCP.

3.5.2.2 Patient Study Module

This section defines Attributes that provide information about the Patient at the time the Study was performed.

TABLE 3.5-3
PATIENT STUDY MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Admitting Diagnoses Description	(0008,1080)	3	Not used
Patient's Age	(0010,1010)	3	Patient age in years at time of exam as calculated from DOB returned from Worklist SCP or entered from user interface.
Patient's Size	(0010,1020)	3	Patient size from Worklist SCP or height from user interface.
Patient's Weight	(0010,1030)	3	Patient weight from Worklist SCP or user interface.
Occupation	(0010,2180)	3	Not used

Additional Patient History	(0010,21B0)	3	Used only if received from Worklist SCP.

3.5.3 Common Series Entity Modules

The following Series IE Modules are common to all Composite Image IODs which reference the Series IE.

3.5.3.1 General Series Module

This section specifies the Attributes which identify and describe general information about the Series within a Study.

TABLE 3.5-4
GENERAL SERIES MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Modality	(0008,0060)	1	Configurable. Default is 'OT'= Other.
Series Instance UID	(0020,000E)	1	Uniquely identifies a series of images within a study. Internally generated.
Series Number	(0020,0011)	2	Internal value which is incremented for each series within a study.
Laterality	(0020,0060)	2C	Laterality of paired body part examined (if applicable).
Series Date	(0008,0021)	3	Not used
Series Time	(0008,0031)	3	Not used
Performing Physicians' Name	(0008,1050)	3	Scheduled Performing Physicians' name from Worklist SCP or Attendant from user interface. The user interface allows the user to enter up to 64 characters.
Protocol Name	(0018,1030)	3	Report name or image type depending on what DICOM report option is used.
Series Description	(0008,103E)	3	Current DICOM store option. One of the following: DXA Images, DXA Structured Reports, DXA Reports, DXA Report Graphics.
Operators' Name	(0008,1070)	3	Scheduled Performing Physicians' name from Worklist SCP or Attendant from user interface. The user interface allows the user to enter up to 64 characters.
Referenced Study Component Sequence	(0008,1111)	3	Used only if MPPS was used for this exam.
>Referenced SOP Class UID	(0008,1150)	1C	Used only if MPPS was used for this exam.
>Referenced SOP Instance UID	(0008,1155)	1C	Used only if MPPS was used for this exam.
Body Part Examined	(0018,0015)	3	Not used
Patient Position	(0018,5100)	2C	Not used. Sent as zero length.
Smallest Pixel Value in Series	(0028,0108)	3	Not used
Largest Pixel Value in Series	(0028,0109)	3	Not used
Requested Attribute Sequence	(0040,0275)	3	
>Requested Procedure ID	(0040,1001)	1C	Used only if received from Worklist SCP.
>Scheduled Procedure Step ID	(0040, 0009)	1C	Used only if received from Worklist SCP.

>Scheduled Procedure Step Description	(0040, 0007)	3	Used only if received from Worklist SCP.
>Scheduled Protocol Code Sequence	(0040,0008)	3	Used only if received from Worklist SCP.
>>Code Value	(0008,0100)	1C	Used only if received from Worklist SCP. HIS code for exam performed.
>>Coding Scheme Designator	(0008,0102)	1C	Used only if received from Worklist SCP. HIS coding scheme designator.
>>Coding Scheme Version	(0008,0103)	1C	Used only if received from Worklist SCP. HIS coding scheme version.
>>Code Meaning	(0008,0104)	1C	Used only if received from Worklist SCP. HIS code meaning for exam performed.
Performed Procedure Step ID	(0040,0253)	3	Used only if MPPS was used for this exam.
Performed Procedure Step Start Date	(0040,0244)	3	Used only if MPPS was used for this exam.
Performed Procedure Step Start Time	(0040,0245)	3	Used only if MPPS was used for this exam.
Performed Procedure Step Description	(0040,0254)	3	Scheduled Procedure Step Description from Worklist SCP. Used only if MPPS was used for this exam.
Performed Protocol Code Sequence	(0040,0260)	3	Used only if MPPS was used for this exam.

3.5.4 Common Equipment Entity Modules

The following Equipment IE Module is common to all Composite Image IODs which reference the Equipment IE.

3.5.4.1 General Equipment Module

This section specifies the Attributes which identify and describe the piece of equipment which produced a Series of Images.

TABLE 3.5-5
GENERAL EQUIPMENT MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Manufacturer	(0008,0070)	2	'GE Healthcare'
Institution Name	(0008,0080)	3	Report title 1 from user interface.
Institution Address	(0008,0081)	3	Report title 2 from user interface.
Station Name	(0008,1010)	3	Name of PC used to acquire image.
Institutional Department Name	(0008,1040)	3	Report title 3 from user interface.
Manufacturer's Model Name	(0008,1090)	3	Lunar scanner model.
Device Serial Number	(0018,1000)	3	Device system number.
Software Versions	(0018,1020)	3	Version of application software that was used to acquire the image.
Spatial Resolution	(0018,1050)	3	Not used
Date of Last Calibration	(0018,1200)	3	Not used
Time of Last Calibration	(0018,1201)	3	Not used
Pixel Padding Value	(0028,0120)	3	Not used

3.5.5 Common Image Entity Modules

The following Image IE Modules are common to all Composite Image IODs which reference the Image IE.

3.5.5.1 General Image Module

This section specifies the Attributes which identify and describe an image within a particular series.

TABLE 3.5-6
GENERAL IMAGE MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Image Number	(0020,0013)	2	Internal value which is incremented for each image within a study series.
Patient Orientation	(0020,0020)	2C	Patient direction of the rows and columns of the image (if applicable).
Image Date	(0008,0023)	2C	Not sent since images not temporally related.
Image Time	(0008,0033)	2C	Not sent since images not temporally related.
Image Type	(0008,0008)	3	Not used
Acquisition Number	(0020,0012)	3	Not used
Acquisition Date	(0008,0022)	3	Date image was acquired.
Acquisition Time	(0008,0032)	3	Time image was acquired.
Referenced Image Sequence	(0008,1140)	3	Not used
>Referenced SOP Class UID	(0008,1150)	1C	
>Referenced SOP Instance UID	(0008,1155)	1C	
Derivation Description	(0008,2111)	3	Not used
Source Image Sequence	(0008,2112)	3	Not used
>Referenced SOP Class UID	(0008,1150)	1C	
>Referenced SOP Instance UID	(0008,1155)	1C	
Images in Acquisition	(0020,1002)	3	Not used
Image Comments	(0020,4000)	3	Encoded Densitometry results (configurable).
Lossy Image Compression	(0028,2110)	3	Not used

3.5.5.1.1 General Image Attribute Descriptions

3.5.5.2 Image Pixel Module

This section specifies the Attributes that describe the pixel data of the image.

TABLE 3.5-7
IMAGE PIXEL MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Samples per Pixel	(0028,0002)	1	Value of '1' when photometric interpretation = 'PALETTE COLOR'. Value of '3' when photometric interpretation = 'RGB'.

Photometric Interpretation	(0028,0004)	1	Value of 'PALETTE COLOR' or 'RGB' for report images.
Rows	(0028,0010)	1	Number of rows in the image
Columns	(0028,0011)	1	Number of columns in the image.
Bits Allocated	(0028,0100)	1	Value always = 0008H.
Bits Stored	(0028,0101)	1	Value always = 0008H.
High Bit	(0028,0102)	1	Value always = 0007H.
Pixel Representation	(0028,0103)	1	Value always = 0000H (unsigned integer).
Pixel Data	(7FE0,0010)	1	
Planar Configuration	(0028,0006)	1C	Value of 0000H (color-by-pixel) for RGB images.
Pixel Aspect Ratio	(0028,0034)	1C	Not sent since aspect ratio always 1\1.
Smallest Image Pixel Value	(0028,0106)	3	Not used
Largest Image Pixel Value	(0028,0107)	3	Not used
Red Palette Color Lookup Table Descriptor	(0028,1101)	1C	Only used if photometric interpretation = PALETTE COLOR.
Green Palette Color Lookup Table Descriptor	(0028,1102)	1C	Only used if photometric interpretation = PALETTE COLOR.
Blue Palette Color Lookup Table Descriptor	(0028,1103)	1C	Only used if photometric interpretation = PALETTE COLOR.
Red Palette Color Lookup Table Data	(0028,1201)	1C	Only used if photometric interpretation = PALETTE COLOR.
Green Palette Color Lookup Table Data	(0028,1202)	1C	Only used if photometric interpretation = PALETTE COLOR.
Blue Palette Color Lookup Table Data	(0028,1203)	1C	Only used if photometric interpretation = PALETTE COLOR.

3.5.6 General Modules

The SOP Common Module is mandatory for all DICOM IODs.

3.5.6.1 SOP Common Module

This section defines the Attributes which are required for proper functioning and identification of the associated SOP Instances. They do not specify any semantics about the Real-World Object represented by the IOD.

TABLE 3.5-8
SOP COMMON MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
SOP Class UID	(0008,0016)	1	1.2.840.10008.5.1.4.1.1.7
SOP Instance UID	(0008,0018)	1	Uniquely identifies an image. Internally generated.
Specific Character Set	(0008,0005)	1C	Character Set that expands or replaces the Basic Graphic Set.
Instance Creation Date	(0008,0012)	3	Not used
Instance Creation Time	(0008,0013)	3	Not used
Instance Creator UID	(0008,0014)	3	Not used

3.5.7 SC Modules

This Section describes modules containing attributes that are specific to SC Image IOD.

3.5.7.1 SC Equipment Module

This Module describes equipment used to convert images into a DICOM format.

TABLE 3.5-9
SC IMAGE EQUIPMENT MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Conversion Type	(0008,0064)	1	'WSD' = Workstation.
Modality	(0008,0060)	3	Not used
Secondary Capture Device ID	(0018,1010)	3	Not used
Secondary Capture Device Manufacturer	(0018,1016)	3	Not used
Secondary Capture Device Manufacturer's Model Name	(0018,1018)	3	Lunar scanner model.
Secondary Capture Device Software Version	(0018,1019)	3	Version of analysis software.
Video Image Format Acquired	(0018,1022)	3	Not used
Digital Image Format Acquired	(0018,1023)	3	Not used

3.5.7.2 SC Image Module

The table in this Section contains IOD Attributes that describe SC images.

TABLE 3.5-10
SC IMAGE MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Date of Secondary Capture	(0018,1012)	3	Date image was analyzed.
Time of Secondary Capture	(0018,1014)	3	Time image was analyzed.

3.5.8 Radiation Dose Module

This Section describes the Attributes that may be used to communicate information related to radiation dose values.

TABLE 3.5-11
RADIATION DOSE MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Total Number of Exposures	(0040,0301)	3	Total number of exposures made during the Peformed Procedure Step.
Entrance Dose in mGy	(0040,8302)	3	Total entrance dose value measured in mGy at the surface of the patient during the Performed Procedure Step.
Exposed Area	(0040,0303)	3	Typical dimension of the exposed area. Row dimension (scan width) followed by column (scan length) in mm.
Exposure Dose Sequence	(0040,030E)	3	Will contain Total Number of Exposures (0040,0301) items.
>KVp	(0018,0060)	3	Peak kilo voltage output of the x-ray generator used.
>X-ray Tube Current in uA	(0018,8151)	3	X-ray tube current in uA.
>Exposure Time	(0018,1150)	3	Time of x-ray exposure in msec.

3.5.9 BMD Image IOD Private Data Element Definition

This section lists the attributes used in this implementation for BMD Image IOD definition. These attributes will only be added if DICOM was selected as the enCORE file archive.

TABLE 3.5-12
PRIVATE CREATOR IDENTIFICATION (GEMS_LUNAR_RAW)

Attribute Name	Tag	VR	VM
Private Creator ID	(7003,0010)	LO	1
enCORE File Name	(7003,1001)	ST	1
enCORE File Data	(7003,1002)	OB	1
enCORE File Length	(7003,1003)	UL	1
enCORE File Modified Time	(7003,1004)	LO	1

4. ENCAPSULATED PDF INFORMATION OBJECT IMPLEMENTATION

4.1 INTRODUCTION

This section specifies the use of the DICOM PDF IOD to represent the information included in Encapsulated PDF documents produced by this implementation. Corresponding attributes are conveyed using the module construct. Encapsulated PDF documents are generated for enCORE report images that are sent to PACS. The contents of this section are:

4.2 - IOD Description

4.3 - IOD Entity-Relationship Model

4.4 - IOD Module Table

4.5- IOD Module Definition

4.2 ENCAPSULATED PDF IOD DESCRIPTION

The Encapsulated PDF Information Object Definition (IOD) describes a PDF document that has been encapsulated within a DICOM information object.

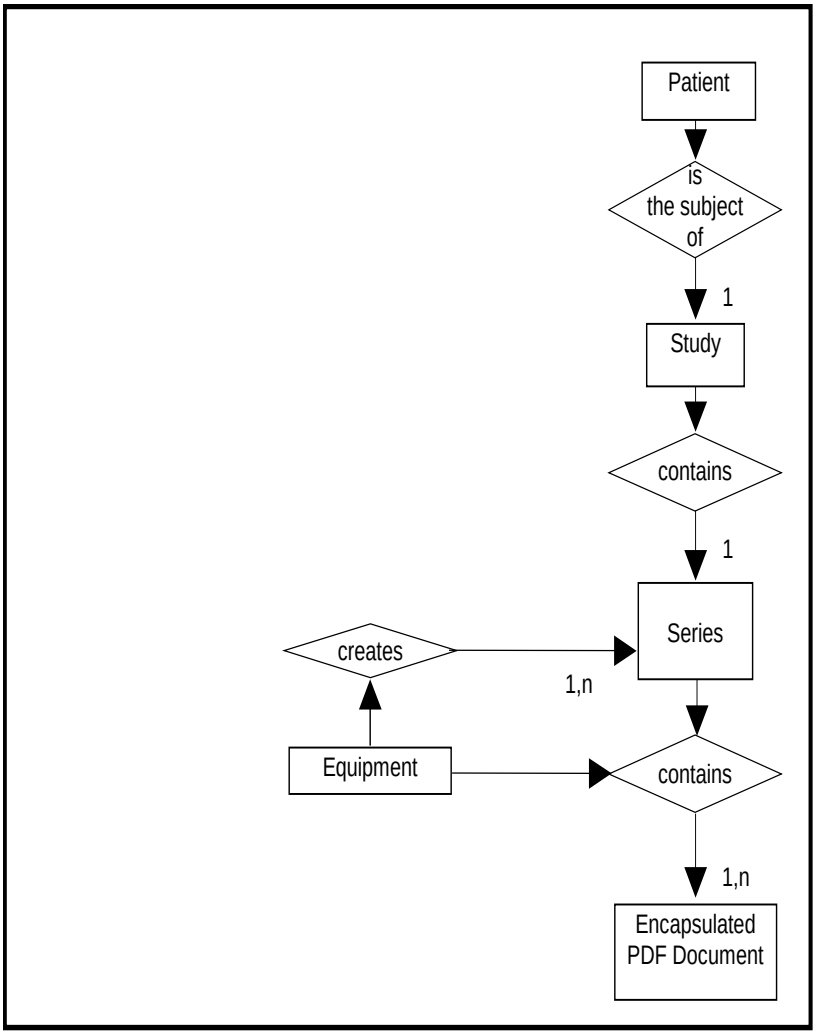
4.3 ENSCAPSULATED PDF ENTITY-RELATIONSHIP MODEL

The Entity-Relationship diagram for the **Encapsulated PDF** interoperability schema is shown in Illustration 4.3-1**.** In this figure, the following diagrammatic convention is established to represent the information organization:

- each entity is represented by a rectangular box
- each relationship is represented by a diamond shaped box
- the fact that a relationship exists between two entities is depicted by lines connecting the corresponding entity boxes to the relationship boxes

The relationships are fully defined with the maximum number of possible entities in the relationship shown.

ILLUSTRATION 4.3-1
ENCAPSULATED DOCUMENT ENTITY RELATIONSHIP DIAGRAM



4.3.1 ENTITY DESCRIPTIONS

Please refer to DICOM Standard Part 3 (Information Object Definitions) for a description of each of the entities contained within the Encapsulated PDF Information Object.

4.3.2 enCORE Mapping of DICOM entities

TABLE 4.3-1
MAPPING OF DICOM ENTITIES TO enCORE ENTITIES

DICOM	enCORE Entity
Patient	Patient
Study	Exam
Series	Series
Encapsulated Document	Report

4.4 ENCAPSULATED PDF IOD MODULE TABLE

Within an entity of the DICOM Encapsulated PDF IOD, attributes are grouped into related set of attributes. A set of related attributes is termed a module. A module facilitates the understanding of the semantics concerning the attributes and how the attributes are related with each other. A module grouping does not infer any encoding of information into datasets.

Table 4.4-1 identifies the defined modules within the entities which comprise the DICOM Encapsulated PDF IOD. Modules are identified by Module Name.

See the DICOM Standard Part 3 for a complete definition of the entities, modules, and attributes.

TABLE 4.4-1
ENCAPSULATED PDF IOD MODULES

Entity Name	Module Name	Reference
Patient	Patient	4.5.1.1
	Specimen Identification	Not Used
	Clinical Trial Subject	Not Used
Study	General Study	4.5.2.1
	Patient Study	4.5.2.2
	Clinical Trial Study	Not Used
Series	Encapsulated Document Series	4.5.5.1
	Clinical Trial Series	Not Used
Equipment	General Equipment	4.5.3.1
	SC Equipment	4.5.5.2
Encapsulated Document	Encapsulated Document	4.5.5.3
	SOP Common	4.5.4.1

4.5 INFORMATION MODULE DEFINITIONS

Please refer to DICOM Standard Part 3 (Information Object Definitions) for a description of each of the entities and modules contained within the Encapsulated PDF Information Object.

The following modules are included to convey Enumerated Values, Defined Terms, and Optional Attributes supported. Type 1 & Type 2 Attributes are also included for completeness and to define what values they may take and where these values are obtained from. It should be noted that they are the same ones as defined in the DICOM Standard Part 3 (Information Object Definitions).

4.5.1 Common Patient Entity Modules

4.5.1.1 Patient Module

This section specifies the Attributes of the Patient that describe and identify the Patient who is the subject of a diagnostic Study. This Module contains Attributes of the patient that are needed for diagnostic interpretation of the Image and are common for all studies performed on the patient.

TABLE 4.5-1
PATIENT MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Patient's Name	(0010,0010)	2	Patient name from Worklist SCP or user interface. The user interface allows the user to enter up to 52 characters for last name, 34 characters for first name, and 1 character for middle initial however only the first 64 characters will be used.
Patient ID	(0010,0020)	2	Patient ID from Worklist SCP or user interface. The user interface allows the user to enter up to 64 characters.
Patient's Birth Date	(0010,0030)	2	Patient birth date from Worklist SCP or user interface.
Patient's Sex	(0010,0040)	2	Patient sex from Worklist SCP or Gender from user interface. HIS codes can be mapped to enCore codes (Female, Male)
Referenced Patient Sequence	(0008,1120)	3	Not used
>Referenced SOP Class UID	(0008,1150)	1C	
>Referenced SOP Instance UID	(0008,1155)	1C	
Patient's Birth Time	(0010,0032)	3	Not used
Other Patient Ids	(0010,1000)	3	Used only if received from Worklist SCP.
Other Patient Names	(0010,1001)	3	Not used
Ethnic Group	(0010,2160)	3	Ethnic group from Worklist SCP or ethnicity from user interface. HIS codes can be mapped to enCore codes (White, Black, Asian, Hispanic, Other)
Patient Comments	(0010,4000)	3	Patient comments from Worklist SCP or user interface. The user interface will allow the user to enter up to 256 characters. If received from the Worklist SCP, up to 10240 characters will be accepted, but only the first 256 characters will be displayed and stored to the image file.

4.5.2 Common Study Entity Modules

The following Study IE Modules are common to all Composite Image IODs which reference the Study IE. These Modules contain Attributes of the patient and study that are needed for diagnostic interpretation of the image.

4.5.2.1 General Study Module

This section specifies the Attributes which describe and identify the Study performed upon the Patient.

TABLE 4.5-2
GENERAL STUDY MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Study Instance UID	(0020,000D)	1	Uniquely identifies a study. Study Instance UID from Worklist SCP or internally generated.
Study Date	(0008,0020)	2	Date of exam.
Study Time	(0008,0030)	2	Time of exam.
Referring Physician's Name	(0008,0090)	2	Referring physician from Worklist SCP or Physician from user interface. The user interface allows the user to enter up to 64 characters.
Study ID	(0020,0010)	2	Requested Procedure ID from Worklist SCP or internally generated.
Accession Number	(0008,0050)	2	Accession number from Worklist SCP or Exam ID from user interface.
Study Description	(0008,1030)	3	User configurable. Can be mapped to either MPPS Performed Procedure Step Description or MWL Requested Procedure Description. If MPPS or MWL not used, set to "DXA <exam type>".
Physician(s) of Record	(0008,1048)	3	Not used
Name of Physician(s) Reading Study	(0008,1060)	3	Not used
Referenced Study Sequence	(0008,1110)	3	Used only if received from Worklist SCP.
>Referenced SOP Class UID	(0008,1150)	1C	Used only if received from Worklist SCP.
>Referenced SOP Instance UID	(0008,1155)	1C	Used only if received from Worklist SCP.

4.5.2.2 Patient Study Module

This section defines Attributes that provide information about the Patient at the time the Study was performed.

TABLE 4.5-3
PATIENT STUDY MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Admitting Diagnoses Description	(0008,1080)	3	Not used
Patient's Age	(0010,1010)	3	Patient age in years at time of exam as calculated from DOB returned from Worklist SCP or entered from user interface.
Patient's Size	(0010,1020)	3	Patient size from Worklist SCP or height from user interface.
Patient's Weight	(0010,1030)	3	Patient weight from Worklist SCP or user interface.
Occupation	(0010,2180)	3	Not used

Additional Patient History	(0010,21B0)	3	Used only if received from Worklist SCP.

4.5.3 Common Equipment Entity Modules

The following Equipment IE Module is common to all Composite Image IODs which reference the Equipment IE.

4.5.3.1 General Equipment Module

This section specifies the Attributes which identify and describe the piece of equipment which produced a Series of Images.

TABLE 4.5-4
GENERAL EQUIPMENT MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Manufacturer	(0008,0070)	2	'GE Healthcare'
Institution Name	(0008,0080)	3	Report title 1 from user interface.
Institution Address	(0008,0081)	3	Report title 2 from user interface.
Station Name	(0008,1010)	3	Name of PC used to acquire image.
Institutional Department Name	(0008,1040)	3	Report title 3 from user interface.
Manufacturer's Model Name	(0008,1090)	3	Lunar scanner model.
Device Serial Number	(0018,1000)	3	Device system number.
Software Versions	(0018,1020)	3	Version of application software that was used to acquire the image.
Spatial Resolution	(0018,1050)	3	Not used
Date of Last Calibration	(0018,1200)	3	Not used
Time of Last Calibration	(0018,1201)	3	Not used
Pixel Padding Value	(0028,0120)	3	Not used

4.5.4 General Modules

The SOP Common Module is mandatory for all DICOM IODs.

4.5.4.1 SOP Common Module

This section defines the Attributes which are required for proper functioning and identification of the associated SOP Instances. They do not specify any semantics about the Real-World Object represented by the IOD.

TABLE 4.5-5
SOP COMMON MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
SOP Class UID	(0008,0016)	1	1.2.840.10008.5.1.4.1.1.7
SOP Instance UID	(0008,0018)	1	Uniquely identifies an image. Internally generated.
Specific Character Set	(0008,0005)	1C	Character Set that expands or replaces the Basic Graphic Set.
Instance Creation Date	(0008,0012)	3	Not used
Instance Creation Time	(0008,0013)	3	Not used
Instance Creator UID	(0008,0014)	3	Not used

4.5.5 Encapsulated Document Modules

This Section describes modules containing attributes that are specific to the Encapsulated PDF IOD.

4.5.5.1 Encapsulated Document Series Module

This module specifies the attributes which identify and describe information about the Encapsulated Document Series within a Study.

TABLE 4.5-6
ENCAPSULATED DOCUMENT SERIES MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Modality	(0008,0060)	1	Configurable. Default is 'SR'. This type definition shall override the definition in the SC Equipment Module.
Series Instance UID	(0020,000E)	1	Uniquely identifies a series of images within a study. Internally generated.
Series Number	(0020,0011)	1	Internal value which is incremented for each series within a study.
Referenced Performed Procedure Step Sequence	(0008,1111)	3	Used only if MPPS was used for this exam
>Referenced SOP Class UID	(0008,1150)	1C	Used only if MPPS was used for this exam
>Referenced SOP Instance UID	(0008,1155)	1C	Used only if MPPS was used for this exam
Series Description	(0008,103E)	3	"DXA Reports"
Requested Attributes Sequence	(0040,0275)	3	Not used

>Requested Procedure ID	(0040,1001)	1C	Used only if received from Worklist SCP.
>Reason for the Requested Procedure	(0040,1002)	3	Not Used
>Reason for the Requested Procedure Code Sequence	(0040,100A)	3	Not Used
>>Code Value	(0008,0100)	1C	
>>Coding Scheme Designator	(0008,0102)	1C	
>>Coding Scheme Version	(0008,0103)	1C	
>>Code Meaning	(0008,0104)	1C	
>Scheduled Procedure Step ID	(0040,0009)	1C	Used only if received from Worklist SCP.
>Scheduled Procedure Step Description	(0040,0007)	3	Used only if received from Worklist SCP.
>Scheduled Protocol Code Sequence	(0040,0008)	3	Used only if received from Worklist SCP.
>>Code Value	(0008,0100)	1C	Used only if received from Worklist SCP. HIS code for exam performed.
>>Coding Scheme Designator	(0008,0102)	1C	Used only if received from Worklist SCP. HIS coding scheme designator.
>>Coding Scheme Version	(0008,0103)	1C	Used only if received from Worklist SCP. HIS coding scheme version.
>>Code Meaning	(0008,0104)	1C	Used only if received from Worklist SCP. HIS code meaning for exam performed.
>>Protocol Context Sequence	(0040,0440)	3	Not used
>>>Content Item Macro			
>>>Content Item Modifier Squence	(0040,0441)	3	
>>>>Content Item Macro			
Performed Procedure Step ID	(0040,0253)	3	Used only if MPPS was used for this exam.
Performed Procedure Step Start Date	(0040,0244)	3	Used only if MPPS was used for this exam.
Performed Procedure Step Start Time	(0040,0245)	3	Used only if MPPS was used for this exam.
Performed Procedure Step Description	(0040,0254)	3	Scheduled Procedure Step Description from Worklist SCP. Used only if MPPS was used for this exam.
Performed Protocol Code Sequence	(0040,0260)	3	Used only if MPPS was used for this exam.
>>Code Value	(0008,0100)	1C	
>>Coding Scheme Designator	(0008,0102)	1C	
>>Coding Scheme Version	(0008,0103)	1C	
>>Code Meaning	(0008,0104)	1C	
>Protocol Context Sequence	(0040,0440)	3	Not Used
>>Content Item Macro			
>>Content Item Modifier Sequence	(0040,0441)	3	
>>>Content Item Macro			
Comments on the Performed Procedure Step	(0040,0280)	3	Not Used

4.5.5.2 SC Equipment Module

This Module describes equipment used to convert documents into a DICOM format.

TABLE 4.5-7
SC IMAGE EQUIPMENT MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Conversion Type	(0008,0064)	1	'WSD' = Workstation.
Modality	(0008,0060)	3	Not used
Secondary Capture Device ID	(0018,1010)	3	Not used
Secondary Capture Device Manufacturer	(0018,1016)	3	Not used
Secondary Capture Device Manufacturer's Model Name	(0018,1018)	3	Lunar scanner model.
Secondary Capture Device Software Version	(0018,1019)	3	Version of analysis software.
Video Image Format Acquired	(0018,1022)	3	Not used
Digital Image Format Acquired	(0018,1023)	3	Not used

4.5.5.3 Encapsulated Document Module

The table in this Section contains IOD Attributes that describe Encapsulated Documents.

TABLE 4.5-8
ENCAPSULATED DOCUMENT MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Instance Number	(0020,0013)	1	A number that identifies this SOP Instance. The value is unique within a series.
Content Date	(0008,0023)	2	The date the document content creation was started (PDF file creation data).
Content Time	(0008,0033)	2	The time the document content creation was started (PDF file creation time).
Acquisition Datetime	(0008,002A)	2	The date and time that the original generation of the data in the document started.
Burned in Annotation	(0028,0301)	1	Indicates whether or not the encapsulated document contains sufficient burned in annotation to identify the patient and date the data was acquired. Enumerated Values: YES NO
Source Instance Sequence	(0042,0013)	1C	Not used
>Referenced SOP Class UID	(0008,1150)	1C	
>Referenced SOP Instance UID	(0008,1155)	1C	
Document Title	(0042,0010)	2	The title of the document.
Concept Name Code Sequence	(0040,A043)	2	Not used
>>Code Value	(0008,0100)	1C	

>>Coding Scheme Designator	(0008,0102)	1C	
>>Coding Scheme Version	(0008,0103)	1C	
>>Code Meaning	(0008,0104)	1C	
MIME Type of Encapsulated Document	(0042,0012)	1	The type of the encapsulated document stream described using the MIME Media Type. 'application/pdf'
Encapsulated Document	(0042,0011)	1	Encapsulated document stream, containing a document encoded according to the MIME type.

4.5.6 Radiation Dose Module

This Section describes the Attributes that may be used to communicate information related to radiation dose values.

TABLE 4.5-9
RADIATION DOSE MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Total Number of Exposures	(0040,0301)	3	Total number of exposures made during the Peformed Procedure Step.
Entrance Dose in mGy	(0040,8302)	3	Total entrance dose value measured in mGy at the surface of the patient during the Performed Procedure Step.
Exposed Area	(0040,0303)	3	Typical dimension of the exposed area. Row dimension (scan width) followed by column (scan length) in mm.
Exposure Dose Sequence	(0040,030E)	3	Will contain Total Number of Exposures (0040,0301) items.
>KVp	(0018,0060)	3	Peak kilo voltage output of the x-ray generator used.
>X-ray Tube Current in uA	(0018,8151)	3	X-ray tube current in uA.
>Exposure Time	(0018,1150)	3	Time of x-ray exposure in msec.

4.5.7 BMD Image IOD Private Data Element Definition

This section lists the attributes used in this implementation for BMD Image IOD definition. These attributes will only be added if DICOM was selected as the enCORE file archive.

TABLE 4.5-10
PRIVATE CREATOR IDENTIFICATION (GEMS_LUNAR_RAW)

Attribute Name	Tag	VR	VM
Private Creator ID	(7003,0010)	LO	1
enCORE File Name	(7003,1001)	ST	1
enCORE File Data	(7003,1002)	OB	1
enCORE File Length	(7003,1003)	UL	1
enCORE File Modified Time	(7003,1004)	LO	1

5. CR INFORMATION OBJECT IMPLEMENTATION

5.1 INTRODUCTION

This section specifies the use of the DICOM CR Image IOD to represent the information included in CR images produced by this implementation. Corresponding attributes are conveyed using the module construct. CR images are generated for enCORE raw scan images that are sent to PACS. The contents of this section are:

5.2 - IOD Description

5.3 - IOD Entity-Relationship Model

5.4 - IOD Module Table

5.5- IOD Module Definition

5.2 CR IOD IMPLEMENTATION

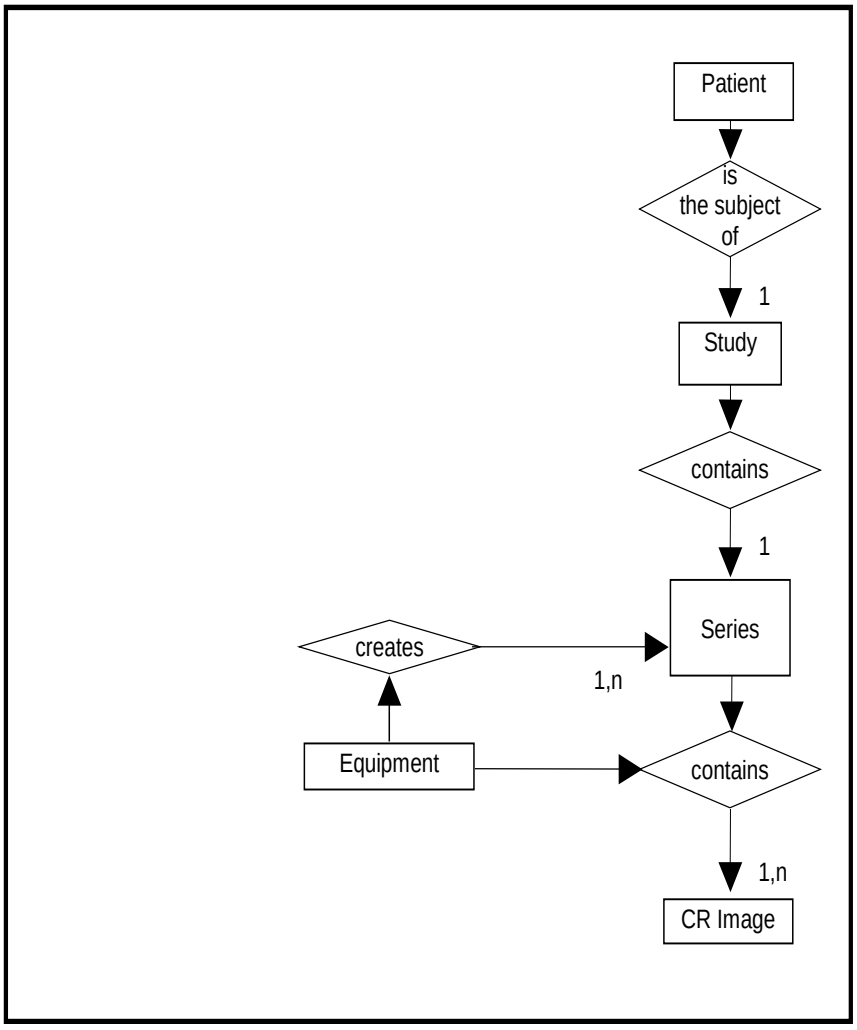
5.3 CR ENTITY-RELATIONSHIP MODEL

The Entity-Relationship diagram for the CR Image interoperability schema is shown in Illustration 5.3-1**.** In this figure, the following diagrammatic convention is established to represent the information organization:

- each entity is represented by a rectangular box
- each relationship is represented by a diamond shaped box
- the fact that a relationship exists between two entities is depicted by lines connecting the corresponding entity boxes to the relationship boxes

The relationships are fully defined with the maximum number of possible entities in the relationship shown.

ILLUSTRATION 5.3-1
CR IMAGE ENTITY RELATIONSHIP DIAGRAM



5.3.1 ENTITY DESCRIPTIONS

Please refer to DICOM Standard Part 3 (Information Object Definitions) for a description of each of the entities contained within the CR Information Object.

5.3.2 enCORE Mapping of DICOM entities

TABLE 5.3-1
MAPPING OF DICOM ENTITIES TO enCORE ENTITIES

DICOM	enCORE Entity
Patient	Patient
Study	Exam
Series	Series
Image	Image

Frame	Not Applicable

5.4 IOD MODULE TABLE

Within an entity of the DICOM CR IOD, attributes are grouped into related set of attributes. A set of related attributes is termed a module. A module facilitates the understanding of the semantics concerning the attributes and how the attributes are related with each other. A module grouping does not infer any encoding of information into datasets.

Table 5.4-1 identifies the defined modules within the entities which comprise the DICOM CR IOD. Modules are identified by Module Name.

See the DICOM Standard Part 3 for a complete definition of the entities, modules, and attributes.

TABLE 5.4-1
CR IMAGE IOD MODULES

Entity Name	Module Name	Reference
Patient	Patient	5.5.1.1
Study	General Study	5.5.2.1
	Patient Study	Not used
Series	General Series	5.5.3.1
	CR Series	5.5.7.1
Equipment	General Equipment	5.5.4.1
Image	General Image	5.5.5.1
	Image Pixel	5.5.5.2
	Contrast/Bolus	Not used
	CR Image	5.5.7.2
	Overlay Plane	Not used
	Curve	Not used
	Modality LUT	Not used
	VOI LUT	Not used
	SOP Common	5.5.6.1

5.5 INFORMATION MODULE DEFINITIONS

Please refer to DICOM Standard Part 3 (Information Object Definitions) for a description of each of the entities and modules contained within the CR Information Object.

The following modules are included to convey Enumerated Values, Defined Terms, and Optional Attributes supported. Type 1 & Type 2 Attributes are also included for completeness and to define what values they may take and where these values are obtained from. It should be noted that they are the same ones as defined in the DICOM Standard Part 3 (Information Object Definitions).

5.5.1 Common Patient Entity Modules

5.5.1.1 Patient Module

This section specifies the Attributes of the Patient that describe and identify the Patient who is the subject of a diagnostic Study. This Module contains Attributes of the patient that are needed for diagnostic interpretation of the Image and are common for all studies performed on the patient.

TABLE 5.5-1
PATIENT MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Patient's Name	(0010,0010)	2	Patient name from Worklist SCP or user interface. The user interface allows the user to enter up to 52 characters for last name, 34 characters for first name, and 1 character for middle initial however only the first 64 characters will be used.
Patient ID	(0010,0020)	2	Patient ID from Worklist SCP or user interface. The user interface allows the user to enter up to 64 characters.
Patient's Birth Date	(0010,0030)	2	Patient birth date from Worklist SCP or user interface.
Patient's Sex	(0010,0040)	2	Patient sex from Worklist SCP or Gender from user interface. HIS codes can be mapped to enCore codes (Female, Male)
Referenced Patient Sequence	(0008,1120)	3	Not used
>Referenced SOP Class UID	(0008,1150)	1C	
>Referenced SOP Instance UID	(0008,1155)	1C	
Patient's Birth Time	(0010,0032)	3	Not used
Other Patient Ids	(0010,1000)	3	Used only if received from Worklist SCP.
Other Patient Names	(0010,1001)	3	Not used
Ethnic Group	(0010,2160)	3	Ethnic group from Worklist SCP or ethnicity from user interface. HIS codes can be mapped to enCore codes (White, Black, Asian, Hispanic, Other)
Patient Comments	(0010,4000)	3	Patient comments from Worklist SCP or user interface. The user interface will allow the user to enter up to 256 characters. If received from the Worklist SCP, up to 10240 characters will be accepted, but only the first 256 characters will be displayed and stored to the image file.

5.5.2 Common Study Entity Modules

The following Study IE Modules are common to all Composite Image IODs which reference the Study IE. These Modules contain Attributes of the patient and study that are needed for diagnostic interpretation of the image.

5.5.2.1 General Study Module

This section specifies the Attributes which describe and identify the Study performed upon the Patient.

TABLE 5.5-2
GENERAL STUDY MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Study Instance UID	(0020,000D)	1	Uniquely identifies a study. Study Instance UID from Worklist SCP or internally generated.
Study Date	(0008,0020)	2	Date of exam.
Study Time	(0008,0030)	2	Time of exam.
Referring Physician's Name	(0008,0090)	2	Referring physician from Worklist SCP or Physician from user interface. The user interface allows the user to enter up to 64 characters.
Study ID	(0020,0010)	2	Requested Procedure ID from Worklist SCP or internally generated.
Accession Number	(0008,0050)	2	Accession number from Worklist SCP or Exam ID from user interface.
Study Description	(0008,1030)	3	User configurable. Can be mapped to either MPPS Performed Procedure Step Description or MWL Requested Procedure Description. If MPPS or MWL not used, set to "DXA <exam type>".
Physician(s) of Record	(0008,1048)	3	Not used
Name of Physician(s) Reading Study	(0008,1060)	3	Not used
Referenced Study Sequence	(0008,1110)	3	Used only if received from Worklist SCP.
>Referenced SOP Class UID	(0008,1150)	1C	Used only if received from Worklist SCP.
>Referenced SOP Instance UID	(0008,1155)	1C	Used only if received from Worklist SCP.

5.5.2.2 Patient Study Module

This section defines Attributes that provide information about the Patient at the time the Study was performed.

TABLE 5.5-3
PATIENT STUDY MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Admitting Diagnoses Description	(0008,1080)	3	Not used

Patient's Age	(0010,1010)	3	Patient age in years at time of exam as calculated from DOB returned from Worklist SCP or entered from user interface.
Patient's Size	(0010,1020)	3	Patient size from Worklist SCP or height from user interface.
Patient's Weight	(0010,1030)	3	Patient weight from Worklist SCP or user interface.
Occupation	(0010,2180)	3	Not used
Additional Patient History	(0010,21B0)	3	Used only if received from Worklist SCP.

5.5.3 Common Series Entity Modules

The following Series IE Modules are common to all Composite Image IODs which reference the Series IE.

5.5.3.1 General Series Module

This section specifies the Attributes which identify and describe general information about the Series within a Study.

TABLE 5.5-4
GENERAL SERIES MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Modality	(0008,0060)	1	'CR'= Computed Radiography
Series Instance UID	(0020,000E)	1	Uniquely identifies a series of images within a study. Internally generated.
Series Number	(0020,0011)	2	Internal value which is incremented for each series within a study.
Laterality	(0020,0060)	2C	Laterality of paired body part examined (if applicable).
Series Date	(0008,0021)	3	Not used
Series Time	(0008,0031)	3	Not used
Performing Physicians' Name	(0008,1050)	3	Scheduled Performing Physicians' name from Worklist SCP or Attendant from user interface. The user interface allows the user to enter up to 64 characters.
Protocol Name	(0018,1030)	3	Report name or image type depending on what DICOM report option is used.
Series Description	(0008,103E)	3	Current DICOM store option. One of the following: DXA Images, DXA Structured Reports, DXA Reports, DXA Report Graphics.
Operators' Name	(0008,1070)	3	Scheduled Performing Physicians' name from Worklist SCP or Attendant from user interface. The user interface allows the user to enter up to 64 characters.
Referenced Study Component Sequence	(0008,1111)	3	Used only if MPPS was used for this exam.
>Referenced SOP Class UID	(0008,1150)	1C	Used only if MPPS was used for this exam.
>Referenced SOP Instance UID	(0008,1155)	1C	Used only if MPPS was used for this exam.
Body Part Examined	(0018,0015)	3	Not used
Patient Position	(0018,5100)	2C	Not used. Sent as zero length.
Smallest Pixel Value in Series	(0028,0108)	3	Not used
Largest Pixel Value in Series	(0028,0109)	3	Not used
Requested Attribute Sequence	(0040,0275)	3	
>Requested Procedure ID	(0040,1001)	1C	Used only if received from Worklist SCP.
>Scheduled Procedure Step ID	(0040, 0009)	1C	Used only if received from Worklist SCP.
>Scheduled Procedure Step Description	(0040, 0007)	3	Used only if received from Worklist SCP.
>Scheduled Protocol Code Sequence	(0040,0008)	3	Used only if received from Worklist SCP.

>>Code Value	(0008,0100)	1C	Used only if received from Worklist SCP. HIS code for exam performed.
>>Coding Scheme Designator	(0008,0102)	1C	Used only if received from Worklist SCP. HIS coding scheme designator.
>>Coding Scheme Version	(0008,0103)	1C	Used only if received from Worklist SCP. HIS coding scheme version.
>>Code Meaning	(0008,0104)	1C	Used only if received from Worklist SCP. HIS code meaning for exam performed.
Performed Procedure Step ID	(0040,0253)	3	Used only if MPPS was used for this exam.
Performed Procedure Step Start Date	(0040,0244)	3	Used only if MPPS was used for this exam.
Performed Procedure Step Start Time	(0040,0245)	3	Used only if MPPS was used for this exam.
Performed Procedure Step Description	(0040,0254)	3	Scheduled Procedure Step Description from Worklist SCP. Used only if MPPS was used for this exam.
Performed Protocol Code Sequence	(0040,0260)	3	Used only if MPPS was used for this exam.

5.5.4 Common Equipment Entity Modules

The following Equipment IE Module is common to all Composite Image IODs which reference the Equipment IE.

5.5.4.1 General Equipment Module

This section specifies the Attributes which identify and describe the piece of equipment which produced a Series of Images.

TABLE 5.5-5
GENERAL EQUIPMENT MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Manufacturer	(0008,0070)	2	'GE Healthcare'
Institution Name	(0008,0080)	3	Report title 1 from user interface.
Institution Address	(0008,0081)	3	Report title 2 from user interface.
Station Name	(0008,1010)	3	Name of PC used to acquire image.
Institutional Department Name	(0008,1040)	3	Report title 3 from user interface.
Manufacturer's Model Name	(0008,1090)	3	Lunar scanner model.
Device Serial Number	(0018,1000)	3	Device system number.
Software Versions	(0018,1020)	3	Version of application software that was used to acquire the image.
Spatial Resolution	(0018,1050)	3	Not used
Date of Last Calibration	(0018,1200)	3	Not used
Time of Last Calibration	(0018,1201)	3	Not used
Pixel Padding Value	(0028,0120)	3	Not used

5.5.5 Common Image Entity Modules

The following Image IE Modules are common to all Composite Image IODs which reference the Image IE.

5.5.5.1 General Image Module

This section specifies the Attributes which identify and describe an image within a particular series.

TABLE 5.5-6
GENERAL IMAGE MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Image Number	(0020,0013)	2	Internal value which is incremented for each image within a study series.
Patient Orientation	(0020,0020)	2C	Patient direction of the rows and columns of the image (if applicable).
Image Date	(0008,0023)	2C	Not sent since images not temporally related.
Image Time	(0008,0033)	2C	Not sent since images not temporally related.
Image Type	(0008,0008)	3	Not used
Acquisition Number	(0020,0012)	3	Not used
Acquisition Date	(0008,0022)	3	Date image was acquired.
Acquisition Time	(0008,0032)	3	Time image was acquired.
Referenced Image Sequence	(0008,1140)	3	Not used
>Referenced SOP Class UID	(0008,1150)	1C	
>Referenced SOP Instance UID	(0008,1155)	1C	
Derivation Description	(0008,2111)	3	Not used
Source Image Sequence	(0008,2112)	3	Not used
>Referenced SOP Class UID	(0008,1150)	1C	
>Referenced SOP Instance UID	(0008,1155)	1C	
Images in Acquisition	(0020,1002)	3	Not used
Image Comments	(0020,4000)	3	Encoded Densitometry results.
Lossy Image Compression	(0028,2110)	3	Not used

5.5.5.2 Image Pixel Module

This section specifies the Attributes that describe the pixel data of the image.

TABLE 5.5-7
IMAGE PIXEL MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Samples per Pixel	(0028,0002)	1	Value always = ‘1’.
Photometric Interpretation	(0028,0004)	1	Value always = ‘MONOCHROME2’.
Rows	(0028,0010)	1	Number or rows in the image.
Columns	(0028,0011)	1	Number of columns in the image.
Bits Allocated	(0028,0100)	1	Value always = 0008H.
Bits Stored	(0028,0101)	1	Value always = 0008H.

High Bit	(0028,0102)	1	Value always = 0007H.
Pixel Representation	(0028,0103)	1	Value always = 0000H (unsigned integer).
Pixel Data	(7FE0,0010)	1	
Planar Configuration	(0028,0006)	1C	Not used
Pixel Aspect Ratio	(0028,0034)	1C	Not sent since aspect ratio always 1\1.
Smallest Image Pixel Value	(0028,0106)	3	Not used
Largest Image Pixel Value	(0028,0107)	3	Not used
Red Palette Color Lookup Table Descriptor	(0028,1101)	1C	Not used
Green Palette Color Lookup Table Descriptor	(0028,1102)	1C	Not used
Blue Palette Color Lookup Table Descriptor	(0028,1103)	1C	Not used
Red Palette Color Lookup Table Data	(0028,1201)	1C	Not used
Green Palette Color Lookup Table Data	(0028,1202)	1C	Not used
Blue Palette Color Lookup Table Data	(0028,1203)	1C	Not used

5.5.6 General Modules

The SOP Common Module is mandatory for all DICOM IODs.

5.5.6.1 SOP Common Module

This section defines the Attributes which are required for proper functioning and identification of the associated SOP Instances. They do not specify any semantics about the Real-World Object represented by the IOD.

TABLE 5.5-8
SOP COMMON MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
SOP Class UID	(0008,0016)	1	1.2.840.10008.5.1.4.1.1.1
SOP Instance UID	(0008,0018)	1	Uniquely identifies an image. Internally generated.
Specific Character Set	(0008,0005)	1C	Character Set that expands or replaces the Basic Graphic Set.
Instance Creation Date	(0008,0012)	3	Not used
Instance Creation Time	(0008,0013)	3	Not used
Instance Creator UID	(0008,0014)	3	Not used

5.5.7 CR Modules

This Section describes modules containing attributes that are specific to CR Image IOD.

5.5.7.1 CR Series Module

This Module contains IOD Attributes that describe a computed radiography series performed on the patient.

TABLE 5.5-9
CR SERIES MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Body Part Examined	(0018,0015)	2	Not used. Sent as zero length.
View Position	(0018,5101)	2	Not used. Sent as zero length.
Filter Type	(0018,1160)	3	Not used
Collimator/grid Name	(0018,1180)	3	Not used
Focal Spot	(0018,1190)	3	Not used
Plate Type	(0018,1260)	3	Not used
Phosphor Type	(0018,1261)	3	Not used

5.5.7.2 CR Image Module

The table in this Section contains IOD Attributes that describe CR images.

TABLE 5.5-10
CR IMAGE MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
KVP	(0018,0060)	3	Not used
Plate ID	(0018,1004)	3	Not used
Distance Source to Detector	(0018,1110)	3	Not used
Distance Source to Patient	(0018,1111)	3	Not used
Exposure Time	(0018,1150)	3	Not used
X-ray Tube Current	(0018,1151)	3	Not used
Exposure	(0018,1152)	3	Not used
Generator Power	(0018,1170)	3	Not used
Acquisition Device Processing Description	(0018,1400)	3	Not used
Acquisition Device Processing Code	(0018,1401)	3	Not used
Cassette Orientation	(0018,1402)	3	Not used
Cassette Size	(0018,1403)	3	Not used
Exposures on Plate	(0018,1404)	3	Not used
Relative X-ray Exposure	(0018,1405)	3	Not used
Sensitivity	(0018,6000)	3	Not used

5.5.8 Radiation Dose Module

This Section describes the Attributes that may be used to communicate information related to radiation dose values.

TABLE 5.5-11
RADIATION DOSE MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Total Number of Exposures	(0040,0301)	3	Total number of exposures made during the Peformed Procedure Step.
Entrance Dose in mGy	(0040,8302)	3	Total entrance dose value measured in mGy at the surface of the patient during the Performed Procedure Step.
Exposed Area	(0040,0303)	3	Typical dimension of the exposed area. Row dimension (scan width) followed by column (scan length) in mm.
Exposure Dose Sequence	(0040,030E)	3	Will contain Total Number of Exposures (0040,0301) items.
>KVp	(0018,0060)	3	Peak kilo voltage output of the x-ray generator used.
>X-ray Tube Current in uA	(0018,8151)	3	X-ray tube current in uA.
>Exposure Time	(0018,1150)	3	Time of x-ray exposure in msec.

5.5.9 BMD Image IOD Private Data Element Definition

This section lists the attributes used in this implementation for BMD Image IOD definition. These attributes will only be added if DICOM was selected as the enCORE file archive.

TABLE 5.5-12
PRIVATE CREATOR IDENTIFICATION (GEMS_LUNAR_RAW)

Attribute Name	Tag	VR	VM
Private Creator ID	(7003,0010)	LO	1
enCORE File Name	(7003,1001)	ST	1
enCORE File Data	(7003,1002)	OB	1
enCORE File Length	(7003,1003)	UL	1
enCORE File Modified Time	(7003,1004)	LO	1

6. PRINT MANAGEMENT SOP CLASS DEFINITION

6.1 INTRODUCTION

This section of the DICOM Conformance Statement specifies the supported Print Management SOP and Meta SOP Classes, the optional attributes and service elements supported, the valid range of values for mandatory and optional attributes, and the status code behavior.

This section contains:

6.2.1 - Basic Film Session SOP Class

6.2.1 - Basic Film Box SOP Class

6.2.3 - Image Box SOP Classes

6.2.4 - Printer SOP Class

6.2 PRINT MANAGEMENT SOP CLASS DEFINITIONS

6.2.1 Basic Film Session SOP Class

6.2.1.1 IOD Description

6.2.1.1.1 IOD modules

Module	Reference	Module Description
SOP Common		Contains SOP Common information
Basic Film Session Presentation Module	6.2.1.1.2	Contains Film Session presentations information
Basic Film Session Relationship	6.2.1.1.3	References to related SOPs

6.2.1.1.2 Basic Film Session Presentation Module

Attribute name	Tag	Attribute Description
Number of Copies	(2000,0010)	Default is 1. Max is 20. This field is user configurable.
Print Priority	(2000,0020)	'MEDIUM'
Medium Type	(2000,0030)	Not used
Film Destination	(2000,0040)	Not used
Film Session Label	(2000,0050)	Not used
Memory Allocation	(2000,0060)	Not used

6.2.1.1.3 Basic Film Session Relationship Module

Attribute Name	Tag	Attribute Description
Referenced Film Box Sequence	(2000,0500)	Not used
>Referenced SOP Class UID	(0008,1150)	
>Referenced SOP Instance UID	(0008,1155)	

6.2.1.2 DIMSE Service Group

DIMSE Service Element	Usage SCU
N-CREATE	M
N-SET	Not used
N-DELETE	Not used
N-ACTION	Not used

6.2.1.2.1 N-CREATE

6.2.1.2.1.1 Attributes

Attribute Name	Tag	Usage SCU
Number of Copies	(2000,0010)	Used
Print Priority	(2000,0020)	Used
Medium Type	(2000,0030)	Not used
Film Destination	(2000,0040)	Not used
Film Session Label	(2000,0050)	Not used
Memory Allocation	(2000,0060)	Not used

6.2.1.2.1.2 Status

Service Status	Status Codes	Further Meaning	Application Behavior When receiving Status Codes
Warning	B600	Memory allocation not supported	Ignored
Success	0000	Film session successfully created	Ignored

6.2.1.2.1.3 Behavior

The N-CREATE DIMSE Service is used to request that the SCP create a Film Session SOP Instance.

6.2.2 Basic Film Box SOP Class

6.2.2.1 IOD Description

6.2.2.1.1 IOD modules

Module	Reference	Module Descripion
SOP Common		Contains SOP Common information
Basic Film Box Presentation Module	6.2.2.1.2	Contains Film Box presentation information
Basic Film Box Relationship	6.2.2.1.3	References to related SOPs

6.2.2.1.2 Basic Film Box Presentation Module

Attribute Name	Tag	Attribute Description
Image Display Format	(2010,0010)	'STANDARD\1,1'
Annotation Display Format ID	(2010,0030)	Not used
Film Orientation	(2010,0040)	'PORTRAIT'
Film Size ID	(2010,0050)	'8INX10IN''or '14INX17IN'. This field is user configurable.
Magnification Type	(2010,0060)	Not used
Smoothing Type	(2010,0080)	Not used
Border Density	(2010,0100)	'WHITE'
Empty Image Density	(2010,0110)	Not used
Min Density	(2010,0120)	Not used
Max Density	(2010,0130)	Not used
Trim	(2010,0140)	Not used
Configuration Information	(2010,0150)	Not used

6.2.2.1.3 Basic Film Box Relationship Module

Attribute Name	Tag	Attribute Description
Referenced Film Session Sequence	(2010,0500)	
>Referenced SOP Class UID	(0008,1150)	1.2.840.10008.5.1.1.1
>Referenced SOP Instance UID	(0008,1155)	Provided by printer SCP.
Referenced Image Box Sequence	(2010,0510)	Not used
>Referenced SOP Class UID	(0008,1150)	
>Referenced SOP Instance UID	(0008,1155)	
Referenced Basic Annotation Box Sequence	(2010,0520)	Not used
>Referenced SOP Class UID	(0008,1150)	
>Referenced SOP Instance UID	(0008,1155)	

6.2.2.2 DIMSE Service Group

DIMSE Service Element	Usage SCU
N-CREATE	M
N-ACTION	M
N-DELETE	Used
N-SET	Not used

6.2.2.2.1 N-CREATE

6.2.2.2.1.1 Attributes

Attribute Name	Tag	Usage SCU
Image Display Format	(2010,0010)	M
Referenced Film Session Sequence	(2010,0500)	M
>Referenced SOP Class UID	(0008,1150)	M
>Referenced SOP Instance UID	(0008,1155)	M
Referenced Image Box Sequence	(2010,0510)	-
>Referenced SOP Class UID	(0008,1150)	-
>Referenced SOP Instance UID	(0008,1155)	-
Referenced Basic Annotation Box Sequence	(2010,0520)	Not used
>Referenced SOP Class UID	(0008,1150)	
>Referenced SOP Instance UID	(0008,1155)	
Film Orientation	(2010,0040)	Used
Film Size ID	(2010,0050)	Used
Magnification Type	(2010,0060)	Not used
Max Density	(2010,0130)	Not used
Configuration Information	(2010,0150)	Not used
Annotation Display Format ID	(2010,0030)	Not used
Smoothing Type	(2010,0080)	Not used
Border Density	(2010,0100)	Used
Empty Image Density	(2010,0110)	Not used
Min Density	(2010,0120)	Not used
Trim	(2010,0140)	Not used

6.2.2.2.1.2 Status

There are no specific status codes.

6.2.2.2.1.3 Behavior

The N-CREATE DIMSE Service is used to request that the SCP create a Film Box SOP Instance.

6.2.2.2.2 N-DELETE

6.2.2.2.2.1 Behavior

The N-DELETE DIMSE Service is used to request the SCP to delete the Basic Film Box SOP Instance hierarchy.

6.2.2.2.3 N-ACTION

6.2.2.2.3.1 Attributes

Action Type Name	Action Type ID	Attribute	Tag	Usage SCU
Print	1	Referenced Print Job Sequence	(2100,0500)	Not used
		>Referenced SOP Class UID	(0008,1150)	
		>Referenced SOP Instance UID	(0008,1155)	

6.2.2.2.3.2 Status

Service Status	Status Codes	Further Meaning	Application Behavior When receiving Status Codes
Success	0000	Film accepted for printing; if supported, the Print Job SOP Instance is created	Displays print success message and moves on to next job.
Warning	B603	Film Box SOP Instance hierarchy does not contain Image Box SOP Instances (empty page)	Displays print failure message and moves on to next job.
Failure	C602	Unable to create Print Job SOP Instance; print queue is full	Displays print failure message and moves on to next job.
	C604	Image position collision : multiple images assigned to single image position	Displays print failure message and moves on to next job.
	C603	Image size is larger than image box size (by using the specified magnification value)	Displays print failure message and moves on to next job.

6.2.2.2.3.3 Behavior

The N-ACTION DIMSE Service is used to request the SCP to print the number of copies configured by the user to a film of the film session.

6.2.3 Image Box SOP Classes

6.2.3.1 Basic Grayscale Image Box SOP Class

6.2.3.1.1 IOD description

6.2.3.1.1.1 IOD modules

Module	Reference	Module Description
SOP Common		Contains SOP Common information
Image Box Presentation Module	6.2.3.1.1.2	Contains Image Box presentation information

6.2.3.1.1.2 Image Box Pixel Presentation Module

Attribute Name	Tag	Attribute Description
Image Position	(2020,0010)	Value always ‘1’.
Polarity	(2020,0020)	Not used Note: if Polarity (2020,0020) is not specified by the SCU, the SCP shall print with ‘NORMAL’ polarity.
Magnification Type	(2010,0060)	Not used
Smoothing Type	(2010,0080)	Not used
Requested Image Size	(2020,0030)	Not used
Preformatted Grayscale Image Sequence	(2020,0110)	
>Samples Per Pixel	(0028,0002)	Values always ‘1’.
>Photometric Interpretation	(0028,0004)	Value always ‘MONOCHROME2’.
>Rows	(0028,0010)	Number of rows in the image.
>Columns	(0028,0011)	Number of columns in the image.
>Pixel Aspect Ratio	(0028,0034)	Not sent since aspect ratio always 1\1.
>Bits Allocated	(0028,0100)	Value always = 0008H.
>Bits Stored	(0028,0101)	Value always = 0008H.
>High Bit	(0028,0102)	Value always = 0007H.
>Pixel Representation	(0028,0103)	Value always = 0000H (unsigned interger).
>Pixel Data	(7FE0,0010)	

6.2.3.1.2 DIMSE Service Group

DIMSE Service Element	Usage SCU
N-SET	M

6.2.3.1.2.1 N-SET

6.2.3.1.2.1.1 Attributes

Attribute Name	Tag	Usage SCU
Image Position	(2020,0010)	M
Preformatted Grayscale Image Sequence	(2020,0110)	M
>Samples Per Pixel	(0028,0002)	M
>Photometric Interpretation	(0028,0004)	M
>Rows	(0028,0010)	M
>Columns	(0028,0011)	M
>Pixel Aspect Ratio	(0028,0034)	Not used
>Bits Allocated	(0028,0100)	M
>Bits Stored	(0028,0101)	M
>High Bit	(0028,0102)	M
>Pixel Representation	(0028,0103)	M
>Pixel Data	(7FE0,0010)	M
Polarity	(2020,0020)	Not used
Referenced Overlay Sequence	(0008,1130)	Not used
>SOP Class UID	(0008,1150)	Not used
>SOP Instance UID	(0008,1155)	Not used
Magnification Type	(2010,0060)	Not used
Smoothing Type	(2010,0080)	Not used
Requested Image Size	(2020,0030)	Not used

6.2.3.1.2.1.2 Status

Service Status	Status Codes	Further Meaning	Application Behavior When receiving Status Codes
Failure	C605	Insufficient memory in printer to store the image	Ignored

6.2.3.1.2.1.3 Behavior

The N-SET DIMSE Service is used to update the Basic Grayscale Image Box SOP Instance.

6.2.4 Printer SOP Class

6.2.4.1 IOD Description

6.2.4.1.1 IOD modules

Module	Reference	Module Description
SOP Common		Contains SOP Common information
Printer Module	6.2.4.1.2	Contains status information to monitor the printer

6.2.4.1.2 Printer Module

Attribute Name	Tag	Attribute Description
Printer Status	(2110,0010)	Displayed in Printer Test dialog to show status of selected printer and in job queue window if print job fails.
Printer Status Info	(2110,0020)	Displayed in Printer Test dialog to show information of selected printer and in job queue window if print job fails.
Printer Name	(2110,0030)	Displayed in Printer Test dialog to show name of selected printer and in job queue window if print job fails.
Manufacturer	(0008,0070)	Displayed in Printer Test dialog to show information of selected printer.
Manufacturer Model Name	(0008,1090)	Displayed in Printer Test dialog to show information of selected printer.
Device Serial Number	(0018,1000)	Displayed in Printer Test dialog to show information of selected printer.
Software Versions	(0018,1020)	Displayed in Printer Test dialog to show information of selected printer.
Date Of Last Calibration	(0018,1200)	Displayed in Printer Test dialog to show information of selected printer.
Time Of Last Calibration	(0018,1201)	Displayed in Printer Test dialog to show information of selected printer.

6.2.4.2 DIMSE Service Group

DIMSE Service Element	Usage SCU
N-EVENT-REPORT	M
N-GET	U

6.2.4.2.1 N-EVENT-REPORT

6.2.4.2.1.1 Attributes

Event Type Name	Event Type ID	Attribute	Tag	Usage SCU
Normal	1			
Warning	2	Printer Name	(2110,0030)	Displayed in job queue window if print job fails.
		Printer Status Info	(2110,0020)	Displayed in job queue window if print job fails.
Failure	3	Printer Name	(2110,0030)	Displayed in job queue window if print job fails.
		Printer Status Info	(2110,0020)	Displayed in job queue window if print job fails.

6.2.4.2.1.2 Behavior

Displays print failure message and moves on to next job. Failed job is retried after have processed all other jobs in job queue.

6.2.4.2.2 N-GET

6.2.4.2.2.1 Attributes

Attribute name	Tag	Usage SCU
Printer Status	(2110,0010)	Used
Printer Status Info	(2110,0020)	Used
Printer Name	(2110,0030)	Used
Manufacturer	(0008,0070)	Used
Manufacturer Model Name	(0008,1090)	Used
Device Serial Number	(0018,1000)	Used
Software Versions	(0018,1020)	Used
Date Last Calibration	(0018,1200)	Used
Time Last Calibration	(0018,1201)	Used

6.2.4.2.2.2 Behavior

The N-GET DIMSE Service is used to et a Printer SOP Instance.

7. MODALITY WORKLIST INFORMATION MODEL DEFINITION

7.1 INTRODUCTION

This section specifies the use of the DICOM Modality Worklist Information Model used to organize data and against which a Modality Worklist Query will be performed. The contents of this section are:

7.2 - Information Model Description

7.3 - Information Model Entity-Relationship Model

6.4 - Information Model Module Table

7.5- Information Model Keys

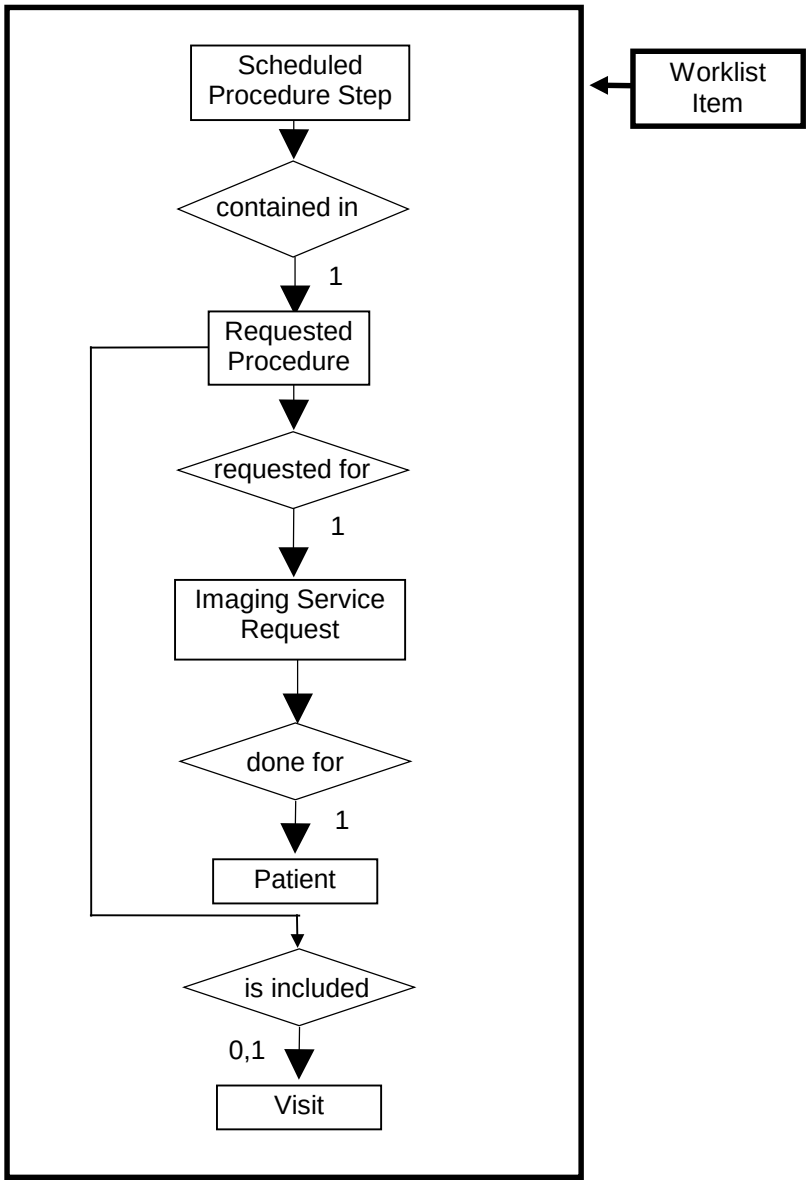
7.2 MODALITY WORKLIST INFORMATION MODEL DESCRIPTION

7.3 MODALITY WORKLIST INFORMATION MODEL ENTITY-RELATIONSHIP MODEL

The Entity-Relationship diagram for the Modality Worklist Information Model schema is shown in Illustration 7.3-1. It represents the information that composes a Worklist Item. In this figure, the following diagrammatic convention is established to represent the information organization:

- each entity is represented by a rectangular box
- each relationship is represented by a diamond shaped box
- the fact that a relationship exists between two entities is depicted by lines connecting the corresponding entity boxes to the relationship boxes

ILLUSTRATION 7.3-1
MODALITY WORKLIST INFORMATION MODEL E/R DIAGRAM



7.3.1 ENTITY DESCRIPTIONS

Please refer to DICOM Standard PS 3.3. (Information Object Definitions) and PS 3.4 (Service Class Specifications) for a description of each of the Entities contained within the Modality Worklist Information Model.

7.3.1.1 Scheduled Procedure Step

Scheduled Procedure Step is implemented in a basic form to allow for the user to retrieve a subset of attributes.

7.3.1.2 Requested Procedure Entity Description

Requested Procedure is implemented in a basic form to allow for the user to retrieve a subset of attributes.

7.3.1.3 Imaging Service Request Entity Description

Imaging Service Request is implemented in a basic form to allow for the user to retrieve a subset of attributes.

7.3.1.4 Visit Entity Description

Visit Entity is implemented in a basic form to allow for the user to retrieve a subset of attributes.

7.3.1.5 Patient Entity Description

Patient Entity is implemented in a basic form to allow for the user to retrieve a subset of attributes.

7.3.2 enCORE Mapping of DICOM entities

TABLE 7.3-1
MAPPING OF DICOM ENTITIES TO enCORE ENTITIES

DICOM	enCORE Entity
Scheduled Procedure Step	Image
Requested Procedure	Exam
Imaging Service Request	Exam
Visit	Exam
Patient	Patient

7.4 INFORMATION MODEL MODULE TABLE

Within an entity of the DICOM Modality Worklist Information Model, attributes are grouped into related set of attributes. A set of related attributes is termed a module. A module facilitates the understanding of the semantics concerning the attributes and how the attributes are related with each other. A module grouping does not infer any encoding of information into datasets.

Table 7.4-1 identifies the defined modules within the entities which comprise the DICOM Modality Worklist Information Model. Modules are identified by Module Name.

See the DICOM Standard PS 3.3 and PS 3.4 for a complete definition of the entities, modules, and attributes.

TABLE 7.4-1
MODALITY WORKLIST INFORMATION MODEL MODULES

Entity Name	Module Name	Reference
Scheduled Procedure Step	SOP Common	Not used
	Scheduled Procedure Step	7.5.2.1
Requested Procedure	Requested Procedure	7.5.3.1
Imaging Service Request	Imaging Service Request	7.5.4.1
Visit	Visit Identification	Not used
	Visit Status	7.5.5.1
	Visit Relationship	Not used
	Visit Admission	Not used
Patient	Patient Relationship	Not used
	Patient Identification	7.5.6.1
	Patient Demographic	7.5.6.2
	Patient Medical	7.5.6.3

7.5 INFORMATION MODEL KEYS

Please refer to DICOM Standard PS 3.3. (Information Object Definitions) and PS 3.4 (Service Class Specifications) for a description of each of the Entities contained within the Modality Worklist Information Model.

The following Module descriptions are included to specify what data elements are supported and what type of matching can be applied. It should be noted that they are the same ones as defined in the DICOM Standard PS 3.4 (Service Class Specifications). The list of data elements that is requested is configurable by the user.

7.5.1 Supported Matching

Following are the types of matching that can be requested by the implementation:

- single value matching
- date range matching
- wild card matching

7.5.2 Scheduled Procedure Step Entity

7.5.2.1 Scheduled Procedure Step Module

TABLE 7.5-2
SCHEDULED PROCEDURE STEP MODULE ATTRIBUTES

Attribute Name	Tag	Expected Matching Key Type	Expected Returned Key Type	Mapped into the Image / MPPS	Note
Scheduled Procedure Step Sequence	(0040,0100)	R	1	No/No	
>Scheduled Station AE Title	(0040,0001)	R	1	No/No	Single value matching is supported. This field is dynamically configurable by the user.
>Scheduled Procedure Step Start Date	(0040,0002)	R	1	Yes/No	Single value and range matching is supported. This field is dynamically configurable by the user. 'Today', 'Tomorrow', or date range matching is supported through the user interface.
>Scheduled Procedure Step Start Time	(0040,0003)	R	1	Yes/No	Single value and range matching is supported. This field is dynamically configurable by the user. 'Morning', 'Afternoon', or time range matching is supported through the user interface.
>Modality	(0008,0060)	R	1	Yes/Yes	Single value matching is supported. This field is configurable by the user. Default is 'OT'=Other.
>Scheduled Performing Physician's Name	(0040,0006)	R	2	Yes/Yes	Single value and wild card matching are supported. This field is dynamically configurable by the user. Mapped to Performing Physician's Name and Operator's Name in MPPS and Image.
>Scheduled Procedure Step Description	(0040,0007)	O	1C	Yes/Yes	
>Scheduled Station Name	(0040,0010)	O	2	Yes/No	
>Scheduled Procedure Step Location	(0040,0011)	O	2	No/Yes	Mapped to Performed Location in MPPS.
>Scheduled Protocol Code Sequence	(0040,0008)	O	1C	Yes/Yes	
>>Code Value	(0008,0100)	O	1C	Yes/Yes	HIS code for image(s) to acquire.
>>Coding Scheme Designator	(0008,0102)	O	1C	Yes/Yes	HIS coding scheme designator.
>>Coding Scheme Version	(0008,0103)	O	3	Yes/Yes	HIS coding scheme version.
>>Code Meaning	(0008,0104)	O	3	Yes/Yes	HIS code meaning for image(s) to acquire.
>Scheduled Procedure Step ID	(0040,0009)	O	1	Yes/Yes	Mapped to Scheduled Procedure Step ID in MPPS.

7.5.3 Requested Procedure Entity

7.5.3.1 Requested Procedure Module

TABLE 7.5-3
REQUESTED PROCEDURE MODULE ATTRIBUTES

Attribute Name	Tag	Expected Matching Key Type	Expected Returned Key Type	Mapped into the Image / MPPS	Note
Requested Procedure ID	(0040,1001)	O	1	Yes/Yes	Single value matching is supported. This field is dynamically configurable by the user. Mapped to Requested Procedure ID and Study ID in Image and MPPS.
Requested Procedure Description	(0032,1060)	O	1C	Yes/Yes	Single value matching is supported. This field is dynamically configurable by the user. Mapped to Requested Procedure Description in MPPS.
Requested Procedure Code Sequence	(0032,1064)	O	1C	No/No	
>Code Value	(0008,0100)	O	1C	No/No	
>Coding Scheme Designator	(0008,0102)	O	1C	No/No	
>Coding Scheme Version	(0008,0103)	0	3	No/No	
>Code Meaning	(0008,0104)	O	3	No/No	
Study Instance UID	(0020,000D)	O	1	Yes/Yes	
Referenced Study Sequence	(0008,1110)	O	2	Yes/Yes	
>Referenced SOP Class UID	(0008,1150)	O	1C	Yes/Yes	
>Referenced SOP Instance UID	(0008,1155)	O	1C	Yes/Yes	
Requested Procedure Comments	(0040,1400)	O	3	No/No	
Names of Intended Recipients of results	(0040,1010)	O	3	No/No	

7.5.4 Imaging Service Request Entity

7.5.4.1 Imaging Service Request Module

TABLE 7.5-4
IMAGING SERVICE REQUEST MODULE ATTRIBUTES

Attribute Name	Tag	Expected Matching Key Type	Expected Returned Key Type	Mapped into the Image/MPPS	Note

Accession Number	(0008,0050)	O	2	Yes/Yes	Single value matching is supported. This field is dynamically configurable by the user.
Requesting Physician	(0032,1032)	O	2	No/No	
Referring Physician's Name	(0008,0090)	O	2	Yes/No	
Requesting Service	(0032,1033)	O	3	No/No	
Requested Service Comments	(0040,2400)	O	3	No/No	

7.5.5 Visit Entity

7.5.5.1 Visit Status

TABLE 7.5-5
VISIT STATUS MODULE ATTRIBUTES

Attribute Name	Tag	Expected Matching Key Type	Expected Returned Key Type	Mapped into the Image/MPPS	Note
Current Patient Location	(0038,0300)	O	2	No	

7.5.6 Patient Entity

7.5.6.1 Patient Identification

TABLE 7.5-6
PATIENT IDENTIFICATION MODULE ATTRIBUTES

Attribute Name	Tag	Expected Matching Key Type	Expected Returned Key Type	Mapped into the Image/MPPS	Note
Patient's Name	(0010,0010)	R	1	Yes/Yes	Single value and wild card matching are supported. This field is dynamically configurable by the user.
Patient ID	(0010,0020)	R	1	Yes/Yes	Single value matching is supported. This field is dynamically configurable by the user.
Other Patient Ids	(0010,1000)	O	3	Yes/No	

7.5.6.2 Patient Demographic

TABLE 7.5-7
PATIENT DEMOGRAPHIC MODULE ATTRIBUTES

Attribute Name	Tag	Expected Matching Key Type	Expected Returned Key Type	Mapped into the Image/MPPS	Note

Patients Birth Date	(0010,0030)	O	2	Yes/Yes	
Patient's Sex	(0010,0040)	O	2	Yes/Yes	
Patient's Weight	(0010,1030)	O	2	Yes/No	
Patient's Address	(0010,1040)	O	3	Yes/No	
Patient's Size	(0010,1020)	O	3	Yes/No	
Patient's Telephone Numbers	(0010,2154)	O	3	Yes/No	First value will be mapped to Home Phone in enCORE. Second value will be mapped to Work Phone.
Ethnic Group	(0010,2160)	O	3	Yes/Yes	
Patient Comments	(0010,4000)	O	3	Yes/No	

7.5.6.3 Patient Medical

TABLE 7.5-8
PATIENT MEDICAL MODULE ATTRIBUTES

Attribute Name	Tag	Expected Matching Key Type	Expected Returned Key Type	Mapped into the Image/MPPS	Note
Pregnancy Status	(0010,21C0)	O	2	No/No	
Medical Alerts	(0010,2000)	O	2	No/No	
Additional Patient History	(0010,21B0)	O	3	Yes/No	

8. MODALITY PERFORMED PROCEDURE STEP SOP CLASS DEFINITION

8.1 INTRODUCTION

This section specifies the use of the DICOM Modality Performed Procedure Step SOP Class. The contents of this section are:

8.2 - IOD Description

8.3 - IOD Entity-Relationship Model

8.4 - IOD Module Table

8.5- IOD Module Definition

8.2 MODALITY PERFORMED PROCEDURE STEP DESCRIPTION

8.2.1 ENTITY DESCRIPTIONS

Please refer to DICOM Standard PS 3.3. (Information Object Definitions) and PS 3.4 (Service Class Specifications) for a description of each of the Entities contained within the Modality Performed Procedure Step SOP Class.

8.3 MODALITY PERFORMED PROCEDURE STEP ENTITY-RELATIONSHIP MODEL

8.3.1 enCORE Mapping of DICOM entities

TABLE 8.3-1
MAPPING OF DICOM ENTITIES TO enCORE ENTITIES

DICOM	enCORE Entity
Performed Procedure Step Relationship	Exam
Performed Procedure Step Information	Exam
Image Acquisition Results	Image

8.4 MODALITY PERFORMED PROCEDURE STEP MODULE TABLE

Within an entity of the DICOM Modality Performed Procedure Step IOD, attributes are grouped into related set of attributes. A set of related attributes is termed a module. A module facilitates the understanding of the semantics concerning the attributes and how the attributes are related with each other. A module grouping does not infer any encoding of information into datasets.

Table 8.4-1 identifies the defined modules within the entities which comprise the DICOM Modality Performed Procedure Step IOD. Modules are identified by Module Name.

See the DICOM Standard PS 3.3 and PS 3.4 for a complete definition of the entities, modules, and attributes.

TABLE 8.4-1
MODALITY PERFORMED PROCEDURE STEP IOD MODULES

Entity Name	Module Name	Reference
Performed Procedure Step Relationship	Performed Procedure Step Relationship	8.5.1.1
Performed Procedure Step Information	Performed Procedure Step Information	8.5.2.1
Image Acquisition Results	Image Acquisition Results	8.5.3.1
Radiation Dose	Radiation Dose	8.5.4.1

8.5 MODALITY PERFORMED PROCEDURE STEP MODULE DEFINITION

Please refer to DICOM Standard PS 3.3. (Information Object Definitions) and PS 3.4 (Service Class Specifications) for a description of each of the Entities contained within the Modality Performed Procedure Step Information Object.

The following Module descriptions are included to specify what data elements are supported. It should be noted that they are the same ones as defined in the DICOM Standard PS 3.4 (Service Class Specifications). The list of data elements is configurable by the user.

8.5.1 Performed Procedure Step Relationship Entity

8.5.1.1 Performed Procedure Step Relationship Module

TABLE 8.5-1
PERFORMED PROCEDURE STEP RELATIONSHIP MODULE ATTRIBUTES

Attribute Name	Tag	Req. Type N-CREATE	Attribute Description N-CREATE	Req. Type N-SET	Attribute Description N-SET
Scheduled Step Attribute Sequence	(0040,0270)	1		Not allowed	
>Study Instance UID	(0020,000D)	1	Study Instance UID from MWL SCP or internally generated.	Not allowed	
>Referenced Study Sequence	(0008,1110)	2	Used only if received from MWL SCP.	Not allowed	
>>Referenced SOP Class UID	(0008,1150)	1C	Used only if received from MWL SCP.	Not allowed	
>>Referenced SOP Instance UID	(0008,1155)	1C	Used only if received from MWL SCP.	Not allowed	
>Accession Number	(0008,0050)	2	Accession number from MWL SCP or Exam ID from user interface.	Not allowed	
>Placer Order Number/Imaging Service Request	(0040,2016)	3	Not used	Not allowed	
>Filler Order Number/Imaging Service Request	(0040,2017)	3	Not used	Not allowed	
>Requested Procedure ID	(0040,1001)	2	Used only if received from MWL SCP.	Not allowed	
>Requested Procedure Description	(0032,1060)	2	Used only if received from MWL SCP.	Not allowed	
>Scheduled Procedure Step ID	(0040,0009)	2	Used only if received from MWL SCP.	Not allowed	
>Scheduled Procedure Step Description	(0040,0007)	2	Used only if received from MWL SCP.	Not allowed	
>Scheduled Protocol Code Sequence	(0040,0008)	2	Used only if received from MWL SCP.	Not allowed	
>>Code Value	(0008,0100)	1C	Used only if received from MWL SCP.	Not allowed	
>>Coding Scheme designator	(0008,0102)	1C	Used only if received from MWL SCP.	Not allowed	
>>Coding Scheme Version	(0008,0102)	3	Used only if received from MWL SCP.	Not allowed	

>>Code Meaning	(0008,0104)	3	Used only if received from MWL SCP.	Not allowed	
Patient's Name	(0010,0010)	2	Patient name from MWL SCP or user interface. The user interface allows the user to enter up to 52 characters for last name, 34 characters for first name, and 1 character for middle initial however only the first 64 characters will be used.	Not allowed	
Patient ID	(0010,0020)	2	Patient ID from MWL SCP or user interface. The user interface allows the user to enter up to 64 characters.	Not allowed	
Patient's Birth Date	(0010,0030)	2	Patient birth date from MWL SCP or user interface.	Not allowed	
Patient's Sex	(0010,0040)	2	Patient sex from MWL SCP or Gender from user interface. HIS codes can be mapped to enCore codes (Female, Male)	Not allowed	
Referenced Patient Sequence	(0008,1150)	2	Not used	Not allowed	
>Referenced SOP Class UID	(0008,1150)	1C	Not used	Not allowed	
>Referenced Instance UID	(0008,1155)	1C	Not used	Not allowed	

8.5.2 Performed Procedure Step Information Entity

8.5.2.1 Performed Procedure Step Information Module

TABLE 8.5-2
PERFORMED PROCEDURE STEP RELATIONSHIP MODULE ATTRIBUTES

Attribute Name	Tag	Req. Type N-CREATE	N-CREATE Attribute Description	Req. Type N-SET	N-SET Attribute Description
Performed Procedure Step ID	(0040,0253)	1	Internally generated.	Not allowed	
Performed Station AE Title	(0040,0241)	1	AE Title of station exam was performed with.	Not allowed	
Performed Station Name	(0040,0241)	2	PC name of station exam was performed with.	Not allowed	
Performed Location	(0040,0243)	2	Scheduled Procedure Step Location from MWL SCP.	Not allowed	
Performed Procedure Step Start Date	(0040,0244)	1	Date exam was started.	Not allowed	
Performed Procedure Step Start Time	(0040,0245)	1	Time exam was started.	Not allowed	
Performed Procedure Step Status	(0040,0252)	1	'IN PROGRESS'	3	'COMPLETED' for saved exam or 'DISCONTINUED' for aborted exam
Performed Procedure Step Description	(0040,0254)	2	Scheduled Procedure Step Description from MWL SCP.	3	
Performed Procedure Type Description	(0040,0255)	2	Used only if received from MWL SCP.	3	
Procedure Code Sequence	(0008,1032)	2	Empty sequence sent.	3	Filled sequence sent.
>Code Value	(0008,0100)	1C		1C	HIS code for exam performed.
>>Coding Scheme Designator	(0008,0102)	1C		1C	HIS coding scheme designator.
>>Coding Scheme Version	(0008,0103)	3		3	HIS coding scheme version.
>>Code Meaning	(0008,0104)	3		3	HIS code meaning for exam performed.
Performed Procedure Step End Date	(0040,0250)	2	Sent as zero length.	3	Date exam was completed.
Performed Procedure Step End Time	(0040,0251)	2	Sent as zero length.	3	Time exam was completed.

8.5.3 Image Acquisition Results Entity

8.5.3.1 Image Acquisition Results Module

TABLE 8.5-3
IMAGE ACQUISITION RESULTS MODULE ATTRIBUTES

Attribute Name	Tag	Req. Type N-CREATE	N-CREATE Attribute Description	Req. Type N-SET	N-SET Attribute Description
Modality	(0008,0060)	1	Configurable. Default is 'OT'= Other.	Not allowed	
Study ID	(0020,0010)	2	Requested Procedure ID from MWL SCP or internally generated.	Not allowed	
Performed Protocol Code Sequence	(0040,0260)	2	Empty sequence sent.	3	Filled sequence sent.
>Code Value	(0008,0100)	1C		1C	HIS code for image(s) acquired.
>Coding Scheme Designator	(0008,0102)	1C		1C	HIS coding scheme designator.
>Coding Scheme Version	(0008,0103)	3		3	HIS coding scheme version.
>Code Meaning	(0008,0104)	3		3	HIS code meaning for image(s) acquired.
Performed Series Sequence	(0040,0340)	2	Empty sequence sent.	3	Filled sequence sent.
>Performing Physician's Name	(0008,1050)	2C		2C	Scheduled Performing Physicians' name from MWL SCP or Attendant from user interface. The user interface allows the user to enter up to 64 characters.
>Protocol Name	(0018,1030)	1C		1C	Exam type selected from user interface.

>Operator's Name	(0008,1070)	2C		2C	Scheduled Performing Physicians' name from MWL SCP or Attendant from user interface. The user interface allows the user to enter up to 64 characters.
>Series Instance UID	(0020,000E)	1C		1C	Internally generated.
>Series Description	(0008,103E)	2C		2C	Not used. Sent as zero length.
>Retrieve AE Title	(0008,0054)	2C		2C	Not used. Sent as zero length.
>Referenced Image Sequence	(0008,1140)	2C		2C	One sequence item for each image acquired.
>>Referenced SOP Class UID	(0008,1150)	1C		1C	1.2.840.10008.5.1.4.1.1.7
>>Referenced SOP Instance UID	(0008,1155)	1C		1C	Internally generated.
>Referenced Standalone SOP Instance Sequence	(0040,0220)	2C		2C	Not used.
>>Referenced SOP Class UID	(0008,1150)	1C		1C	
>>Referenced SOP Instance UID	(0008,1155)	1C		1C	

8.5.4 Radiation Dose Entity

8.5.4.1 Radiation Dose Module

TABLE 8.5-4
RADIATION DOSE MODULE ATTRIBUTES

Attribute Name	Tag	Req. Type N-CREATE	Attribute Description N-CREATE	Req. Type N-SET	Attribute Description N-SET
Total Number of Exposures	(0040,0301)	3	Sent as zero length	3	Number of images acquired in the exam.
Entrance Dose in mGy	(0040,8302)	3	Sent as zero length	3	Total Entrance dose for all images within exam in mGy.
Exposed Area	(0040,0303)	3	Sent as zero length	3	Area of image with max dose (width / length) in mm.
Exposure Dose Sequence	(0040,030E)	3	Empty sequence sent.	3	One item per image in the exam.
>KVp	(0018,0060)	3		3	Peak kilo voltage output of the x-ray tube.
>X-ray Tube Current in uA	(0018,8151)	3		3	X-ray tube current in uA.
>Exposure Time	(0018,1150)	3		3	Time of x-ray expousre in msec.

9. STORAGE COMMITMENT PUSH MODEL SOP CLASS DEFINITION

9.1 INTRODUCTION

This section specifies the use of the DICOM Storage Commitment Push Model SOP Class.

9.2 STORAGE COMMITMENT PUSH SOP MODULE DEFINITION

Please refer to DICOM Standard PS 3.3. (Information Object Definitions) and PS 3.4 (Service Class Specifications) for a description of each of the Entities contained within the Storage Commitment Push Model Information Object.

The following Module descriptions are included to specify what data elements are supported. It should be noted that they are the same ones as defined in the DICOM Standard PS 3.4 (Service Class Specifications).

9.2.1 Storage Commitment Request

The Storage Commitment Request operation allows an SCU to request an SCP to commit to the safekeeping of a set of SOP Instances.

enCORE sends a Storage Commitment Request after a successful Store Request to a DICOM storage SCP.

Upon receipt of an N-ACTION response error status code from the SCP, a failure message will be logged and the failed job placed in a holding queue. A failed job can be manually retried by highlighting the queued job(s) to be retried and selecting the “Retry Selected Jobs” option off the File menu.

9.2.1.1 Action Information

TABLE 9.2-1
STORAGE COMMITMENT REQUEST N-ACTION INFORMATION

Action Type Name	Action Type ID	Attribute Name	Tag	Req. Type	Attribute Description
Request Storage Commitment	1	Transaction UID	(0008,1195)	1	Internally generated number.
		Storage Media File-Set ID	(0088,0130)	3	Not used
		Storage Media File-Set UID	(0088,0140)	3	Not used
		Referenced SOP Sequence	(0008,1199)	1	Supported
		>Referenced SOP Class UID	(0008,1150)	1	Supported
		>Referenced SOP Instance UID	(0008,1155)	1	Supported
		>Storage Media File-Set ID	(0088,0130)	3	Not used

		>Storage Media File-Set UID	(0088,0140)	3	Not used
		Referenced Study Component Sequence	(0008,1111)	1C	Not used
		>Referenced SOP Class UID	(0008,1150)	1	
		>Referenced SOP Instance UID	(0008,1155)	1	

9.2.2 Storage Commitment Result

The Storage Commitment Result notification allows an SCP to inform the SCU whether or not it has accepted storage commitment responsibility for the SOP instances referenced by a Storage Commitment Request.

9.2.2.1 Event Information

TABLE 9.2-2
STORAGE COMMITMENT RESULT N-EVENT-REPORT INFORMATION

Action Type Name	Action Type ID	Attribute Name	Tag	Req. Type	Attribute Description
Storage Commitment Request Successful	1	Transaction UID	(0008,1195)	-	
		Retrieve AE Title	(0008,0054)	-	Not used
		Storage Media File-Set ID	(0088,0130)	-	Not used
		Storage Media File-Set UID	(0088,0140)	-	Not used
		Referenced SOP Sequence	(0008,1199)	-	
		>Referenced SOP Class UID	(0008,1150)	-	
		>Referenced SOP Instance UID	(0008,1155)	-	
		>Retrieve AE Title	(0008,0054)	-	Not used
		>Storage Media File-Set ID	(0088,0130)	-	Not used
		>Storage Media File-Set UID	(0088,0140)	-	Not used

Storage Commitment Request Complete – Failures Exist	2	Transaction UID	(0008,1195)	-	
		Retrieve AE Title	(0008,0054)	-	Not used
		Storage Media File-Set ID	(0088,0130)	-	Not used
		Storage Media File-Set UID	(0088,0140)	-	Not used
		Referenced SOP Sequence	(0008,1199)	-	
		>Referenced SOP Class UID	(0008,1150)	-	
		>Referenced SOP Instance UID	(0008,1155)	-	
		>Retrieve AE Title	(0008,0054)	-	Not used
		>Storage Media File-Set ID	(0088,0130)	-	Not used
		>Storage Media File-Set UID	(0088,0140)	-	Not used
		Failed SOP Sequence	(0008,1198)	-	
		>Referenced SOP Class UID	(0008,1150)	-	
		>Referenced SOP Instance UID	(0008,1155)	-	
		>Failure Reason	(0008,1197)	-	

10. ENHANCED SR INFORMATION OBJECT IMPLMENTATION

10.1 INTRODUCTION

This section specifies the use of the DICOM Enhanced IOD to represent the information included in the Enhanced SR produced by this implementation. The contents of this section are:

10.2 – Enhanced SR Entity-Relationship Model

10.3 – Enhanced SR IOD Module Table

10.4 – Enhanced SR Information Module Definition

10.5 – Enhanced SR private data dictionary

10.6 – Enhanced SR template identification

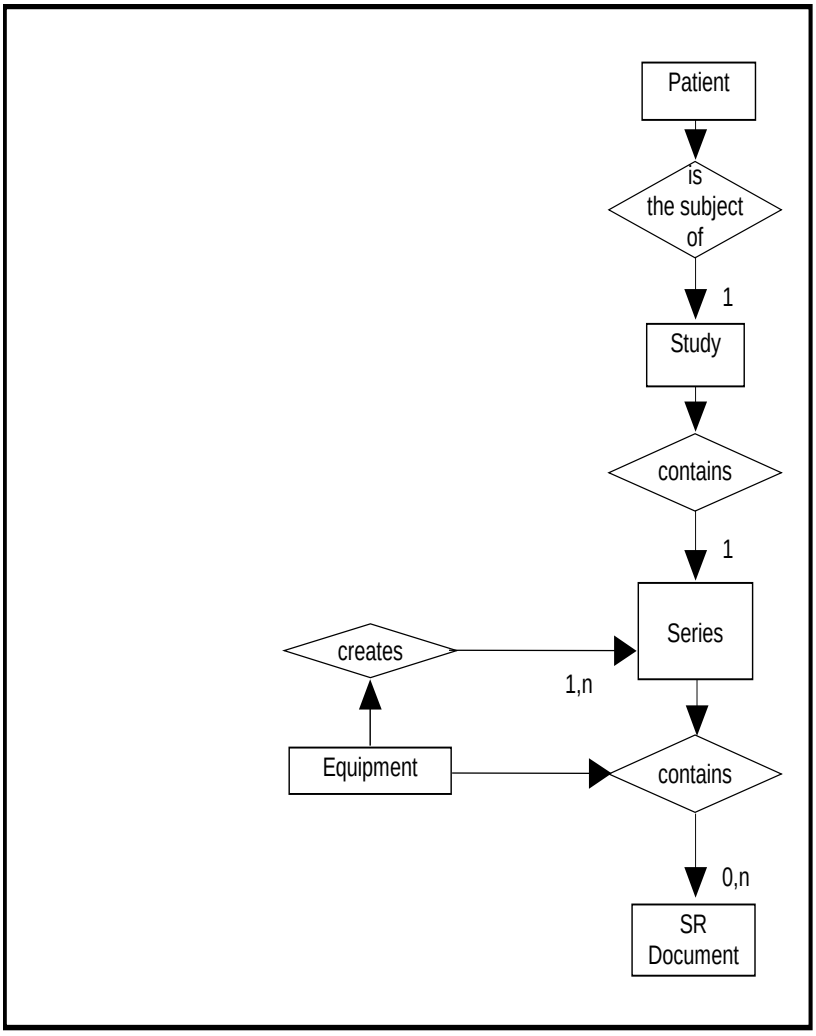
10.2 ENHANCED SR ENTITY-RELATIONSHIP MODEL

The Entity-Relationship diagram for the Enhanced SR interoperability schema is shown in Illustration 10.2-1. In this figure, the following diagrammatic convention is established to represent the information organization.

- each entity is represented by a rectangular box
- each relationship is represented by a diamond shaped box
- the fact that a relationship exists between two entities is depicted by lines connecting the corresponding entity boxes to the relationship boxes

The relationships are fully defined with the maximum number of possible entities in the relationship shown.

ILLUSTRATION 10.2-1
ENHANCED SR ENTITY RELATIONSHIP DIAGRAM



10.2.1 ENTITY DESCRIPTIONS

Please refer to DICOM Standard Part 3 (Information Object Definitions) for a description of each of the entities contained within the Enhanced SR Information Object.

10.2.2 enCORE Mapping of DICOM entities

TABLE 10.2-1
MAPPING OF DICOM ENTITIES TO enCORE ENTITIES

DICOM	enCORE Entity
Patient	Patient
Study	Exam
Series	Series
SR document	SR document

10.3 ENHANCED SR IOD MODULE TABLE

Within an entity of the DICOM Enhanced SR IOD, attributes are grouped into related sets of attributes. A set of related attributes is termed a module. A module facilitates the understanding of the semantics concerning the attributes and how the attributes are related with each other. A module grouping does not infer any encoding of information into datasets.

Table 10.3-1 identifies the defined modules within the entities which comprise the DICOM SR IOD. Modules are identified by Module Name.

See the DICOM Standard Part 3 for a complete definition of the entities, modules, and attributes.

TABLE 10.3-1
ENHANCED SR DOCUMENT IOD MODULES

Entity Name	Module Name	Reference
Patient	Patient	9.4.1.1
Study	General Study	9.4.2.1
	Patient Study	9.4.2.2
Series	SR Document Series	9.4.3.1
Equipment	General Equipment	9.4.4.1
Document	SR Document General	9.4.5.1
	SR Document Content	9.4.5.2
	SOP Common	9.4.6.1

10.4 ENHANCED SR INFORMATION MODULE DEFINITION

Please refer to the DICOM Standard Part 3 (Information Object Definitions) for a description of each of the entities and modules contained within the Enhanced SR Information Object.

The following modules are included to convey Enumerated Values, Defined Terms, and Optional Attributes supported. Type 1 & Type 2 Attributes are also included for completeness and to define what values they may take and where these values are obtained from. It should be noted that they are the same ones as defined in the DICOM Standard Part 3 (Information Object Definitions).

10.4.1 Common Patient Entity Modules

10.4.1.1 Patient Module

This section specifies the Attributes of the Patient that describe and identify the Patient who is the subject of a diagnostic Study. This Module contains Attributes of the patient that are needed for diagnostic interpretation of the Image and are common for all studies performed on the patient.

TABLE 10.4-1
PATIENT MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Patient's Name	(0010,0010)	2	Patient name from Worklist SCP or user interface. The user interface allows the user to enter up to 52 characters for last name, 34 characters for first name, and 1 character for middle initial however only the first 64 characters will be used.
Patient ID	(0010,0020)	2	Patient ID from Worklist SCP or user interface. The user interface allows the user to enter up to 64 characters.
Patient's Birth Date	(0010,0030)	2	Patient birth date from Worklist SCP or user interface.
Patient's Sex	(0010,0040)	2	Patient sex from Worklist SCP or Gender from user interface. HIS codes can be mapped to enCore codes (Female, Male)
Referenced Patient Sequence	(0008,1120)	3	Not used
>Referenced SOP Class UID	(0008,1150)	1C	
>Referenced SOP Instance UID	(0008,1155)	1C	
Patient's Birth Time	(0010,0032)	3	Not used
Other Patient Ids	(0010,1000)	3	Used only if received from Worklist SCP.
Other Patient Names	(0010,1001)	3	Not used
Ethnic Group	(0010,2160)	3	Ethnic group from Worklist SCP or ethnicity from user interface. HIS codes can be mapped to enCore codes (White, Black, Asian, Hispanic, Other)
Patient Comments	(0010,4000)	3	Patient comments from Worklist SCP or user interface. The user interface will allow the user to enter up to 256 characters. If received from the Worklist SCP, up to 10240 characters will be accepted, but only the first 256 characters will be displayed and stored to the image file.

10.4.2 Common Study Entity Modules

The following Study IE Modules are common to all Composite Image IODs which reference the Study IE. These Modules contain Attributes of the patient and study that are needed for diagnostic interpretation of the image.

10.4.2.1 General Study Module

This section specifies the Attributes which describe and identify the Study performed upon the Patient.

TABLE 10.4-2
GENERAL STUDY MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Study Instance UID	(0020,000D)	1	Uniquely identifies a study. Study Instance UID from Worklist SCP or internally generated.
Study Date	(0008,0020)	2	Date of exam.
Study Time	(0008,0030)	2	Time of exam.
Referring Physician's Name	(0008,0090)	2	Referring physician from Worklist SCP or Physician from user interface. The user interface allows the user to enter up to 64 characters.
Study ID	(0020,0010)	2	Requested Procedure ID from Worklist SCP or internally generated.
Accession Number	(0008,0050)	2	Accession number from Worklist SCP or Exam ID from user interface.
Study Description	(0008,1030)	3	User configurable. Can be mapped to either MPPS Performed Procedure Step Description or MWL Requested Procedure Description. If MPPS or MWL not used, set to "DXA <exam type>".
Physician(s) of Record	(0008,1048)	3	Not used
Name of Physician(s) Reading Study	(0008,1060)	3	Not used
Referenced Study Sequence	(0008,1110)	3	Used only if received from Worklist SCP.
>Referenced SOP Class UID	(0008,1150)	1C	Used only if received from Worklist SCP.
>Referenced SOP Instance UID	(0008,1155)	1C	Used only if received from Worklist SCP.

10.4.2.2 Patient Study Module

This section defines Attributes that provide information about the Patient at the time the Study was performed.

TABLE 10.4-3
PATIENT STUDY MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Admitting Diagnoses Description	(0008,1080)	3	Not used
Patient's Age	(0010,1010)	3	Patient age in years at time of exam as calculated from DOB returned from Worklist SCP or entered from user interface.
Patient's Size	(0010,1020)	3	Patient size from Worklist SCP or height from user interface.
Patient's Weight	(0010,1030)	3	Patient weight from Worklist SCP or user interface.
Occupation	(0010,2180)	3	Not used

Additional Patient History	(0010,21B0)	3	Used only if received from Worklist SCP.

10.4.3 SR Document Series Entity Modules

The following SR Doucment Series IE Modules are common to all Composite Image IODs which reference the SR Document Series IE.

10.4.3.1 SR Document Series Module

This section specifies the Attributes that identify and describe general information about the SR Document Series within a Study.

TABLE 10.4-4
SR DOCUMENT SERIES MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Modality	(0008,0060)	1	SR
Series Instance UID	(0020,000E)	1	Uniquely identifies a series of images within a study. Internally generated.
Series Number	(0020,0011)	1	Internal value which is incremented for each series within a study.
Referenced Study Component Sequence	(0008,1111)	2	Empty

10.4.4 Common Equipment Entity Modules

The following Equipment IE Module is common to all Composite Image IODs which reference the Equipment IE.

10.4.4.1 General Equipment Module

This section specifies the Attributes which identify and describe the piece of equipment which produced a Series of Images.

TABLE 10.4-5
GENERAL EQUIPMENT MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Manufacturer	(0008,0070)	2	'GE Healthcare'
Institution Name	(0008,0080)	3	Report title 1 from user interface.
Institution Address	(0008,0081)	3	Report title 2 from user interface.
Station Name	(0008,1010)	3	Name of PC used to acquire image.
Institutional Department Name	(0008,1040)	3	Report title 3 from user interface.
Manufacturer's Model Name	(0008,1090)	3	Lunar scanner model.
Device Serial Number	(0018,1000)	3	Device system number.
Software Versions	(0018,1020)	3	Version of application software that was used to acquire the image.
Spatial Resolution	(0018,1050)	3	Not used
Date of Last Calibration	(0018,1200)	3	Not used
Time of Last Calibration	(0018,1201)	3	Not used
Pixel Padding Value	(0028,0120)	3	Not used

10.4.5 SR Document Entity Modules

The following SR document Modules are common to all Composite Image IODs which reference the Image IE.

10.4.5.1 SR Document General

This section specifies the general Attributes of an SR Document Instance. These Attributes identify the SR Document and provide context for the entire document.

TABLE 10.4-6
SR DOCUMENT GENERAL MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Instance Number	(0020,0013)	1	Internal value which is incremented for each SR instance within a study series.
Completion Flag	(0040,A491)	1	COMPLETE
Completion Flag Description	(0040,A492)	3	Not used
Verification Flag	(0040,A493)	1	UNVERIFIED
Content Date	(0008,0023)	1	Date image was analyzed.
Content Time	(0008,0033)	1	Time image was analyzed.
Verifying Observer Sequence	(0040,A073)	1C	Not used
Predecessor Documents Sequence	(0040,A360)	1C	Not used
Identical Documents Sequence	(0040,A525)	1C	Not used
Referenced Request Sequence	(0040,A370)	1C	Not used
Performed Procedure Code Sequence	(0040,A372)	2	Empty
Current Requested Procedure Evidence Sequence	(0040,A375)	1C	Not used
Pertinent Other Evidence Sequence	(0040,A385)	1C	Not used

10.4.5.2 SR Document Content Module

This section specifies the Attributes contained in the SR Document Content Module. The Attributes in this Module convey the content of an SR Document.

TABLE 10.4-7
SR DOCUMENT CONTENT MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Observation DateTime	(0040,A032)	1C	Not used
Content Template Sequence	(0040,A504)	1C	Template that describes the content of the content item.
> Mapping Resource	(0008,0105)	1	DCMR
> Template Identifier	(0040,DB00)	1	2000
Value Type	(0040,A040)	1	CONTAINER
Concept Name Code Sequence	(0040,A043)	1C	
> Code Value	(0008,0100)	1C	11528-7

> Coding Scheme Designator	(0008,0102)	1C	LN
> Code Meaning	(0008,0104)	1C	Radiology Report
Continutiy of Content	(0040,A050)	1C	SEPARATE
Content Sequence	(0040,A730)	1C	Content of the DICOM SR

10.4.6 General Modules

The SOP Common Module is mandatory for all DICOM IODs.

10.4.6.1 SOP Common Module

This section specifies the Attributes that are required for proper functioning and identification of the associated SOP Instances. They do not specify and semantics about the Real-World Object represented by the IOD.

TABLE 10.4-8
SOP COMMON MODULE ATTRIBUTES

Attribute Name	Tag	Type	Attribute Description
Class SOP UID	(0008,0016)	1	1.2.840.10008.5.1.4.1.1.88.22
SOP Instance UID	(0008,0018)	1	Uniquely identifies an SR instance. Internally generated.
Specific Character Set	(0008,0005)	1C	Character Set that expands or replaces the Basic Graphic Set.
Instance Creation Date	(0008,0012)	3	Not used
Instance Creation Time	(0008,0013)	3	Not used
Instance Creator UID	(0008,0014)	3	Not used

10.5 ENHANCED SR TEMPLATE IDENTIFICATION

This section describes the Basic Diagnostic Imaging Report Template that is used in this implementation.

This template describes how the SR Document Content Module of the Enhanced SR IOD is constrained for the purpose of implementing the Basic Diagnostic Imaging Report.

TID 2000
BASIC DIAGNOSTIC IMAGING REPORT

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
1			CONTAINER	BCID (7000) Diagnostic Imaging Report Document Titles	1	M		Root Node
2	>	HAS CONCEPT MOD	INCLUDE	ETID (1204) Language of Content Item and Descendants	1	M		
3	>	HAS OBS CONTEXT	INCLUDE	ETID (1001) Observation Context	1	M		
4	>	CONTAINS	INCLUDE	ETID DXA Observations	1-n	MC	If ROIs exist	

TID DXA OBSERVATIONS

	NL	Rel with Parent	VT	Concept Name	VM	Req Type	Condition	Value Set Constraint
1			CONTAINER		1	M		
1	>	CONTAINS	TEXT	EV (1000, GELUNAR, “ROI”)		M		
2	>	CONTAINS	NUM	EV (1001, GELUNAR, “BMD”)		M		UNITS=EV (g/cm2, UCUM, “g/cm2”)
3	>	CONTAINS	NUM	EV (1003, GELUNAR, “T-Score”)		O		UNITS=EV (1, UCUM, “no units”)
4	>	CONTAINS	NUM	EV (1005, GELUNAR, “Z-Score”)		O		UNITS=EV (1, UCUM, “no units”)
5	>	CONTAINS	NUM	EV (1002, GELUNAR, “BMC”)		O		UNITS=EV (g, UCUM, “g”)
6	>	CONTAINS	NUM	EV (1004, GELUNAR, “Area”)		O		UNITS=EV (cm2, UCUM, “cm2”)

10.6 ENHANCED SR PRIVATE CODED ENTRIES

The private coded entries that are required for implementing the DXA Observations template are listed below.

TABLE 10.6-1
PRIVATE CODED ENTRIES

Coding Scheme Designator (0008,0102)	Code Value (0008,0100)	Code Meaning (0008,0104)
GELUNAR	1000	ROI
GELUNAR	1001	BMD
GELUNAR	1002	BMC
GELUNAR	1003	T-Score
GELUNAR	1004	Area
GELUNAR	1005	Z-Score
GELUNAR	1000-0-0	C1
GELUNAR	1000-0-1	C2
GELUNAR	1000-0-2	C3
GELUNAR	1000-0-3	C4
GELUNAR	1000-0-4	C5
GELUNAR	1000-0-5	C6

GELUNAR	1000-0-6	C7
GELUNAR	1000-0-7	T1
GELUNAR	1000-0-8	T2
GELUNAR	1000-0-9	T3
GELUNAR	1000-0-10	T4
GELUNAR	1000-0-11	T5
GELUNAR	1000-0-12	T6
GELUNAR	1000-0-13	T7
GELUNAR	1000-0-14	T8
GELUNAR	1000-0-15	T9
GELUNAR	1000-0-16	T10
GELUNAR	1000-0-17	T11
GELUNAR	1000-0-18	T12
GELUNAR	1000-0-19	L1
GELUNAR	1000-0-20	L2
GELUNAR	1000-0-21	L3
GELUNAR	1000-0-22	L4
GELUNAR	1000-0-23	L5
GELUNAR	1000-0-24	Sacrum
GELUNAR	1000-0-25	Coccyx
GELUNAR	1000-0-26	L1-L2
GELUNAR	1000-0-27	L2-L3
GELUNAR	1000-0-28	L1-L4
GELUNAR	1000-0-29	L2-L3
GELUNAR	1000-0-30	L2-L4
GELUNAR	1000-0-31	L3-L4
GELUNAR	1000-0-100	L1-L3(L2)
GELUNAR	1000-0-101	L1-L4(L2)
GELUNAR	1000-0-102	L1-L4(L2,L3)
GELUNAR	1000-0-103	L1-L4(L3)
GELUNAR	1000-0-104	L2-L4(L3)
GELUNAR	1000-1-0	Neck
GELUNAR	1000-1-1	Wards
GELUNAR	1000-1-2	Troch
GELUNAR	1000-1-3	Shaft
GELUNAR	1000-1-4	Total
GELUNAR	1000-1-5	Upper Neck
GELUNAR	1000-1-5	Lower Neck
GELUNAR	1000-5-1	1

GELUNAR	1000-5-2	2
GELUNAR	1000-5-3	3
GELUNAR	1000-5-4	4
GELUNAR	1000-5-5	5
GELUNAR	1000-5-6	6
GELUNAR	1000-5-7	7
GELUNAR	1000-5-8	1A
GELUNAR	1000-5-9	1B
GELUNAR	1000-5-10	1C
GELUNAR	1000-5-11	2A
GELUNAR	1000-5-12	2B
GELUNAR	1000-5-13	2C
GELUNAR	1000-5-14	3A
GELUNAR	1000-5-15	3B
GELUNAR	1000-5-16	3C
GELUNAR	1000-5-17	4
GELUNAR	1000-5-18	5A
GELUNAR	1000-5-19	5B
GELUNAR	1000-5-20	5C
GELUNAR	1000-5-21	6A
GELUNAR	1000-5-22	6B
GELUNAR	1000-5-23	6C
GELUNAR	1000-5-24	7A
GELUNAR	1000-5-25	7B
GELUNAR	1000-5-26	7C
GELUNAR	1000-10-0	Head
GELUNAR	1000-10-1	Arms
GELUNAR	1000-10-2	Legs
GELUNAR	1000-10-3	Trunk
GELUNAR	1000-10-4	Ribs
GELUNAR	1000-10-5	Pelvis
GELUNAR	1000-10-6	Spine
GELUNAR	1000-10-7	Total
GELUNAR	1000-10-51	Left Arm
GELUNAR	1000-10-52	Left Leg
GELUNAR	1000-10-53	Left Trunk
GELUNAR	1000-10-54	Left Total
GELUNAR	1000-10-55	Right Arm
GELUNAR	1000-10-56	Right Leg

GELUNAR	1000-10-57	Right Trunk
GELUNAR	1000-10-58	Right Total
GELUNAR	1000-10-59	Android
GELUNAR	1000-10-60	Gynoid
GELUNAR	1000-11-1	Radius UD
GELUNAR	1000-11-2	Ulna UD
GELUNAR	1000-11-3	Radius 33%
GELUNAR	1000-11-4	Ulna 33%
GELUNAR	1000-11-25	Both UD
GELUNAR	1000-11-26	Both 33%
GELUNAR	1000-11-27	Radius Total
GELUNAR	1000-11-28	Ulna Total
GELUNAR	1000-11-29	Both Total
GELUNAR	1000-13-0	Total
GELUNAR	1000-19-100	Neck Mean
GELUNAR	1000-19-101	Wards Mean
GELUNAR	1000-19-102	Troch Mean
GELUNAR	1000-19-103	Shaft Mean
GELUNAR	1000-19-104	Total Mean
GELUNAR	1000-19-105	Upper Neck Mean
GELUNAR	1000-19-106	Lower Neck Mean
GELUNAR	1000-19-200	Neck Diff.
GELUNAR	1000-19-201	Neck Diff.
GELUNAR	1000-19-202	Troch Diff.
GELUNAR	1000-19-203	Shaft Diff.
GELUNAR	1000-19-204	Total Diff.
GELUNAR	1000-19-205	Upper Neck Diff.
GELUNAR	1000-19-206	Lower Neck Diff.
GELUNAR	2000-0	AP Spine
GELUNAR	2000-1	Right Femur
GELUNAR	2000-2	Left Femur
GELUNAR	2000-5	Right Ortho
GELUNAR	2000-6	Left Ortho
GELUNAR	2000-7	LVA
GELUNAR	2000-9	Lateral Spine
GELUNAR	2000-10	Total Body
GELUNAR	2000-11	Right Forearm
GELUNAR	2000-12	Left Forearm
GELUNAR	2000-13	Right Hand

GELUNAR	2000-14	Left Hand
GELUNAR	2000-16	Small Animal Body
GELUNAR	2000-19	DualFemur
GELUNAR	2000-22	APVA
GELUNAR	10000	DXA Report
GELUNAR	10001	Indications
GELUNAR	10002	Fractures
GELUNAR	10003	Treatments
GELUNAR	10004	Assessment
GELUNAR	10006	Follow-up
GELUNAR	10007	Follow-up Date

11. STUDY ROOT QUERY/RETRIVE INFORMATION MODEL DEFINITION

11.1 INTRODUCTION

This section specifies the use of the DICOM Study Root Query/Retrieve Model used to organize data and against which a Query/Retrieve will be performed. The contents of this section are:

11.2 - Information Model Description

11.3 - Information Model Entity-Relationship Model

11.4 - Information Model Keys

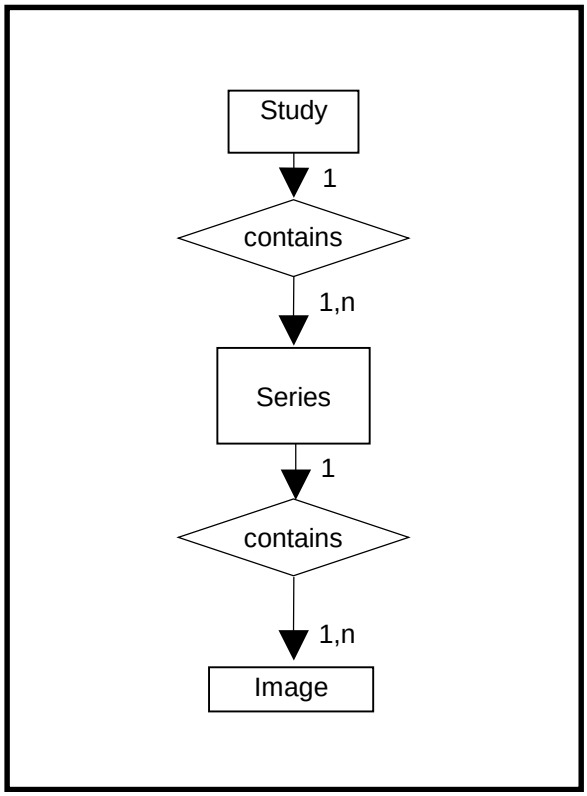
11.2 STUDY ROOT INFORMATION MODEL DESCRIPTION

11.3 STUDY ROOT INFORMATION MODEL ENTITY-RELATIONSHIP MODEL

The Entity-Relationship diagram for the Study Root Information Model schema is shown in Illustration 11.3-1**.** In this figure, the following diagrammatic convention is established to represent the information organization :

- each entity is represented by a rectangular box
- each relationship is represented by a diamond shaped box.
- the fact that a relationship exists between two entities is depicted by lines connecting the corresponding entity boxes to the relationship boxes.

ILLUSTRATION 11.3-1
STUDY ROOT QUERY/RETRIEVE INFORMATION MODEL E/R DIAGRAM



11.3.1 Entity Descriptions

Please refer to DICOM Standard PS 3.4 (Service Class Specifications) for a description of each of the levels contained within the Study Root Query/Retrieve Information Model.

11.3.1.1 Study Entity Description

11.3.1.2 Series Entity Description

11.3.1.3 Image Entity Description

11.3.2 enCORE Mapping of DICOM entities

TABLE 11.3-1
MAPPING OF DICOM ENTITIES TO ENCORE ENTITIES

DICOM	enCORE Entity
Study	Exam
Series	Series

Image	Image

11.4 INFORMATION MODEL KEYS

Please refer to DICOM Standard PS 3.4 (Service Class Specifications) for a description of each of the levels contained within the Study Root Query/Retrieve Information Model.

The following Level descriptions are included to specify what data elements are supported and what type of matching can be applied. It should be noted that they are the same ones as defined in the DICOM v3.0 Standard PS 3.4 (Service Class Specifications).

11.4.1 Supported Matching

Following are the types of matching that can be requested by the implementation :

- Single Value matching
- Universal Matching
- Wild Card Matching

11.4.2 Study Level

This section defines the keys at the Study Level of the Study Root Query/Retrieve Information Model that are supported by this implementation.

TABLE 11.4-2
STUDY LEVEL ATTRIBUTES FOR THE STUDY ROOT QUERY/RETRIEVE INFORMATION MODEL

Attribute Name	Tag	Type	Attribute Description
Study Date	(0008,0020)	R	Single or Universal matching
Study Time	(0008,0030)	R	Universal matching
Accession Number	(0008,0050)	R	Single or Universal matching
Patient's Name	(0010,0010)	R	Single, Universal, or Wild Card matching
Patient ID	(0010,0020)	U	Single or Universal matching
Study ID	(0020,0010)	R	Single or Universal matching
Study Instance UID	(0020,000D)	U	Single or Universal matching
Modalities in Study	(0008,0061)	O	Single or Universal matching
Referring Physician's Name	(0008,0090)	O	Single, Universal, or Wild Card matching
Study Description	(0008,1030)	O	Single or Universal matching
Patient's Birth Date	(0010,0030)	O	Single or Universal matching
Patient's Sex	(0010,0040)	O	Universal matching
Other Patient IDs	(0010,1000)	O	Universal matching
Patient’s Age	(0010,1010)	O	Universal matching
Patient’s Size	(0010,1020)	O	Universal matching
Patient’s Weight	(0010,1030)	O	Universal matching
Ethnic Group	(0010,2160)	O	Universal matching

Additional Patient History	(0010,21B0)	O	Universal matching
Patient Comments	(0010,4000)	O	Universal matching

TABLE 11.4-3
Q/R STUDY LEVEL AND LOCATION FOR RETRIEVE ATTRIBUTES

Attribute Name	Tag	Type	Note
Query Retrieve Level	(0008,0052)	-	Value = STUDY

11.4.3 Series Level

This section defines the keys at the Series Level of the Study Root Query/Retrieve Information Model that are supported by this implementation.

TABLE 11.4-4
SERIES LEVEL ATTRIBUTES FOR THE STUDY ROOT QUERY/RETRIEVE INFORMATION MODEL

Attribute Name	Tag	Type	Attribute Description
Modality	(0008,0060)	R	Single value matching
Series Number	(0020,0011)	R	Single value matching
Series Instance UID	(0020,000E)	U	Single value matching

TABLE 11.4-5
Q/R SERIES LEVEL AND LOCATION FOR RETRIEVE ATTRIBUTES

Attribute Name	Tag	Type	Note
Query Retrieve Level	(0008,0052)	-	Value = SERIES

11.4.4 Image Level

This section defines the keys at the Image Level of the Study Root Query/Retrieve Information Model that are supported by this implementation.

TABLE 11.4-6
IMAGE LEVEL ATTRIBUTES FOR THE STUDY ROOT QUERY/RETRIEVE INFORMATION MODEL

Attribute Name	Tag	Type	Attribute Description
Image Number	(0020,0013)	R	Single value matching
SOP Instance UID	(0008,0018)	U	Single value matching

TABLE 11.4-7
Q/R IMAGE LEVEL AND LOCATION FOR RETRIEVE ATTRIBUTES

Attribute Name	Tag	Type	Note
Query Retrieve Level	(0008,0052)	-	Value = IMAGE